Household's demand for Food Commodities in Pakistan: Issues and Empirical Evidence*

La Demanda de Alimentos en Pakistan: Problemas y Evidencia Empírica

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Abstract

The household's demand analysis is very crucial in the sense that undernourishment negatively affects productivity. Food demand is crucial to gauge the household's ability or willingness to purchase/consume different food commodities. The study attempts to analyze the household's food demand in Pakistan by estimating the Quadratic Almost Ideal Demand System (QUAIDS) on Household Integrated Income and Consumption Survey (HIICS) 2015-16 data. It has been found that the household's locality, dependency ratio, living in own house, age and level of education of household head have significant impacts on demand for different food commodities. It has been further found that hoteling, fruits & dry fruits, soft drinks & bottled water, bakery products, beef & mutton, chicken &seafood are luxury goods. Eggs, sugar & sweets, pulses, tea & coffee, vegetables, rice, and edible oil & ghee are necessity goods. The spices, milk & yogurt and wheat are close to sticky food items. The price elasticities suggest that the demand for beef & mutton, seafood, eggs, and soft drinks is relatively elastic in comparison to other food commodity groups. Moreover, the demand for tea & coffee is least elastic revealing that price of tea has a very marginal impact on its demand.

Resumen

El análisis de la demanda de alimentos de los hogares es crucial porque la desnutrición afecta negativamente a la productividad y porque permite evaluar sus

posibilidades de comprar y consumir diferentes alimentos. Este trabajo aplica el Sistema cuadrático casi ideal de demanda (QUAIDS) a la encuesta integrada de hogares de Pakistan para el periodo 2015-2016. Se encuentra que los principales determinantes de la demanda son la localización, razón de dependencia, propiedad de vivienda, edad y educación, estimando las elasticidades precio e ingreso para los distintos bienes.

1. INTRODUCTION

Pakistan is a consumption-oriented country and approximately 78% of GDP comprises of household consumptions (Economic Survey of Pakistan 2017-18). Over the years there is considerable improvement in the availability of food items in Pakistan. However, due to high population growth (2.4% per annum), the food shortages and an increase in their prices is a repeated phenomenon. It makes food insecurity a consistent challenge for Pakistan due to not adopting modern practices in the agriculture sector and a high population growth rate (Akram and Hamid, 2014). It is also worth mentioning here that undernourishment results in poor health of the human resource, resultant in productivity decline at an individual level, which at the aggregate level hurts GDP growth (Hayat *et al.* 2016).

It is pertinent to mention here that during 1980-2010 the growth in the agriculture sector was steady (between 2-5%), during the same period population growth rate was around 2.6% (Zaheer, 2013). During 2016-17, the agriculture sector grew at 0.2 percent. However, the population growth rate was 2.4% per annum (Economic Survey 2017-18). Due to the gap between population growth and agriculture growth, Pakistan has to import different food commodities. Hunger Index of International Food Policy Research Institute (IFPRI) and Hunger Map of Food & Agriculture Organization (FAO) is also suggestive of the prevalent hunger and starvation in Pakistan (Nazli *et al.*, 2012).

According to some definitions, the un-fulfillment of food needs to be referred to as 'poverty'. In Pakistan poverty is hurting the masses to a great extent. According to the National poverty report 2015-16, around 24.3% households are living below the poverty line (PKR 3,250 per adult equivalent per month). In most of the developing countries, the underlying issue of food security and poverty is due to the people's limited purchasing power. The availability of food at affordable prices and adequate consumer's income are essential components of food security (Hariyati & Raharto, 2012). Hence, food security at the household's level is linked to the fulfillment of the basic needs of food in terms of availability as well as its affordability.

In this regard analysis of food demand becomes very crucial. Because usually demand is considered as the household's ability or willingness to purchase/consume different food commodities like milk, beef, cereals, ghee/edible oil, fruits & vegetables, etc. Furthermore, because of the rapid urbanization and globalization, Pakistani society is experiencing socio-economic transformation. It has resulted in change in tastes and preferences of the households, for example, the demand for value-added and branded products had increased while the demand for traditional products had declined in urban areas. The analysis of food demand transmits signals to the farmers and the food-producing businessmen to analyze their investment decisions and dovetail them with the households demand.

In brief, food demand analysis of households is wider in scope and a comprehensive analysis of household food consumption patterns is necessary for the perspective of social policy, welfare analysis, food security, health economics, labor force, and overall macroeconomic analysis. Keeping in view the significance of the food demand analysis the present study is an attempt to analyze the households food demand and its major determinants in Pakistan by using Household Integrated Income and Consumption Survey (HIICS) 2015-16. By estimating price elasticities of major food items like pulses, grains, ghee/edible oil, meat, milk, sugar, and fruits & vegetables the study will try to answer how the increase in prices will affect overall welfare of the households. The findings of the study will help devise food policy (considering the role of prices and socioeconomic factors) to ensure food security in Pakistan.

The layout of the paper is as follows: a brief overview of the available literature is summarized in section 2. Section 3 discusses the methodology and description of the data and variables used in the study. Section 4 presents the empirical results of the study. Conclusions and implications are given in the final section followed by references.

2. Literature Review

Analysis of consumer's demand is always an area of economic research. Over the years numerous studies have been conducted to analyze the food demand. It has been found that in Sri Lanka, rice and dhal are necessary food items whereas bread and fish are luxury food items (Pallegedara, 2019). In Vietnam, rice is found to be a necessary food item (Hoang, 2018).

Studies have been conducted in Pakistan indicating that demand for chicken is income-elastic, suggesting that an increase in income, the demand of chicken increases. However, the gram is a relatively inferior good (Burki, 1997). The farm households in Pakistan consider meat and milk as luxury good while they consider pulses as necessities (Farooq and Muhammad, 1999). Similarly, Zahoor *et al.* (2011) found that in Punjab milk and meat are luxuries whereas cooking oil and vegetables are necessities. Furthermore, households in Baluchistan (both in urban and rural areas) consider all food items, except vegetable oil, as necessities (Yousaf and Khalil, 2012).

According to Ahmad and Arshad (2007), urban households in Pakistan consider health, housing and wheat as 'absolute necessities'. On the other hand, according to rural households; housing, wheat, tobacco, clothing are recognized as 'absolute necessities'. Similarly, in the rural areas, dairy products are considered as luxury food items while in the urban areas only poor households consider dairy products as luxury goods and for the rest, dairy products are normal goods.

Wong (2018) found that the demand for fish is inelastic with the changes in the price of meat and fish in South Korea. However, the demand for beef and pork is very sensitive to changes in their prices. Similarly, Mudassar, *et al.* (2012) found that fish and mutton in rural areas of Pakistan and only mutton in urban areas of Pakistan are luxury food items.

However, the household behavior in developed countries is different as compared to developing countries. Gil and Molina (2005) found that picnics/leisure and transport are luxury goods; whereas Tobacco and Health are necessities. Molina (1994) reveals that meat, bread, and cereals, eggs, fish and milk are necessities, while vegetables and fruit are found to be luxury goods in Spain. In a latter study, Molina (1997) found that income elasticity of transport has the highest value. It is almost twice of food, tobacco, and beverages.

Different studies had also explored the role of various socioeconomic factors in determining the household consumption patterns. It has been found that income of the household, prices of food items, education of the household's head and ethnicity has a significant impact on determining the demand of major food goods in Sri Lanka (Pallegedara, 2019).

In Vietnam, households headed by females and having more than three children, spend a relatively higher portion of their income on milk consumption (Phuong *et al.*, 2014). In the USA, it has been found that flavored milk and white milk are competitors for soymilk. The age, income, education, employment status, race, region, presence of children and ethnicity have a significant impact on the demand of soymilk (Dharmasena and Capps, 2014).

In Pakistan, it has been found that age (Farooq and Muhammad, 1999), household size, income (Sher, Ahmad, and Safdar, 2012), profession and education (Haq, *et al.* 2011) are major determinants of food consumption behavior. Ahmad, *et al.* (2012) reveals that households belonging to the lower-income group spend most of their income on necessities. However, households belonging to higher income groups spend a larger portion of their income on luxuries. Haq, *et al.* (2011) suggest that rural households are more sensitive to the change in prices in comparison to the urban households.

The literature review suggests that most of the studies conducted in Pakistan are based on old data. However, due to globalization food patterns of Pakistani households had changed considerably in recent years. Furthermore, according to the best of my knowledge, this is the first study that estimated Quadratic Almost Ideal Demand System (QUAIDS), model. Hence to fill this gap in the existing literature on the subject, the present study has estimated QUAIDS model by incorporating demographic variables, on the latest available data.

3. Data and Methodology

Theoretical Background

The theory of consumer demand is founded on the ideas of commodity set, utility function and the axioms of consumer preference order, suggesting a very established structure (Raunikar and Huang, 1987). Three broad approaches have been used in applied demand systems. In the first approach system of demand, equations are derived by using the utility maximization problem e.g. The Linear Expenditure System (Stone, 1954) and Indirect Addilog Model (Paris and Houthakker, 1955). The second approach is to construct a demand system with the Ad-hoc Naive Model (Deaton 1986) specifications by imposing specified theoretical restrictions e.g. Generalized Addilog Demand System (Theil 1969). In the third and most widely used approach; demand system is based on an approximation of an arbitrarily specified functional form e.g. Rotterdam model (Theil, 1965), Translog model (Christensen *et al.*, 1975), Almost Ideal Demand System (Deaton & Muellbauer, 1980) and Quadratic Almost Ideal Demand System (Banks *et al.*, 1997).

The present study will use the Quadratic Almost Ideal Demand System (QUAIDS), model. It is the extended form of the Almost Ideal Demand System (AIDS) model. The QUAIDS developed by Banks *et al.* (1997) and further extended by Poi (2013) to augment demographic variables has been widely used to estimate price and food expenditure elasticities. It has been used in calculating food demand in urban areas of China (Zheng & Henneberry, 2010 and Gould &Villarreal, 2006), to analyze nutrient and food demand in Malawi (Ecker & Qaim, 2011), fish demand in Philippines (Garcia *et al.*, 2005), food demand in Nigeria (Elijah *et al.*, 2009), Indonesia (Pangaribowo & Tsegai, 2011), India (Ganesh-Kumar, *et al.*, 2012), Bangladesh (Ganesh-Kumar, Prasad, & Pullabhotla, 2012), rice demand in Malaysia (Tey *et al.*, 2008) and food demand projections for Ethiopia (Tafere, *et al.* 2011).

The indirect utility function lays the foundations of the Quadratic AIDS (QAIDS) model. We consider a consumer having household/demographic characteristics of y and having an income level of m and he has to purchase k categories of food items by facing price level of p. It can be written in the following functional form.

$$(1) \qquad lnU(m, p, y) = \left\{ \left(\frac{\ln(m) - lna(p, y)}{b(p, y)} \right)^{-1} + \delta(p, y) \right\}^{-1}$$

Where lna(.), δ(.) and, b(.) are the price aggregators and can be defined/written in the following forms:

$$\ln a(p,y) = \alpha_0 + \sum_{i=1}^{k}\left(\alpha_i + \sum_{j=1}^{k}\alpha_{ik}y_n\right)p_i + \frac{1}{2}\sum_{i=1}^{k}\sum_{j=1}^{k}\lambda_{ij}lnp_ip_j$$

(2) $$b(p,y) = \prod_{i=1}^{k}p_i^{\beta_{i0}+\sum_{j=1}^{k}\beta_{ik}y_k}$$

$$\delta(p,y) = \sum_{i=1}^{k}\left(\gamma_{i0} + \sum_{j=1}^{k}\gamma_{ik}y_k\right)lnp_i$$

α_{ik}, β_{ik}, γ_{ik} and λ_{ik} are the parameters to be estimated. Let q_i represents the quantity of ith good consumed by a particular household. The expenditure share on the ith good can be defined as $\omega_i = \dfrac{p_iq_i}{m}$. Applying Roy's identity on equation 1 we can obtain the expenditure of i goods.

$$\omega_i = \sum_{i=1}^{k}\alpha_{ik}y_k + \sum_{j=1}^{k}\lambda_{ij}lnp_j + \sum_{i=1}^{k}\beta_{ik}y_k\{lnm - lna(p,y)\} + \frac{\sum_{i=1}^{k}\gamma_{ik}y_k}{b(p,y)}\{lnm - lna(p,y)\}^2$$

It is pertinent to mention here that estimated coefficients have to follow the conditions of homogeneity, adding up and symmetry conditions it imposes the following restrictions:

$$\sum_{i=1}^{k}a_{ik} = 1 \qquad \sum_{i=1}^{k}\beta_{ik} = 0 \quad \sum_{i=1}^{k}\lambda_{ij} = 0$$

$$\sum_{i=1}^{k}\gamma_{ik} = 0 \quad and \quad \lambda_{ij} = \lambda_{ji}$$

These theoretical hypotheses have significant importance in applied research. It is pertinent to mention here that the study has estimated the restricted model assuming these hypotheses.

Based on the model the uncompensated price elasticity of ith good concerning prices variation in the jth good will is calculated as:

$$\varepsilon_{ij} = \delta_{ij} + \frac{1}{w_i}\left[\lambda_{ij}\right.$$

$$-\left\{\beta_{ik}y_k + \frac{2\sum_{i=1}^{k}\gamma_{ik}y_k}{b(p,y)}(lnm - lna(p,y))\right\}$$

$$\left.\times\left\{\alpha_j + \sum_{s}\lambda_{js}lnp_s - \frac{\beta_{jk}y_k}{b(p,y)}(lnm - lna(p,y))^2\right\}\right]$$

Similarly the expenditure or income elasticity of the ith good will be:

$$v_i = 1 + \frac{1}{w_i}\left[\lambda_{ij} - \left\{\beta_{ik}y_k + \frac{2\sum_{i=1}^{k}\gamma_{ik}y_k}{b(p,y)}\big(lnm - lna(p,y)\big)\right\}\right]$$

Data

The study will use the data of Household Integrated Income and Consumption Survey (HIICS) 2015-16 conducted by the Pakistan Bureau of Statistics (PBS), Islamabad. In HIICS 2015-16, a total of 24,238 households were interviewed. The rural households were 8,083 (33%) and urban households were 16,155 (67%). It is pertinent to mention here that the urban population is given higher representation to account-far the impacts of Consumer Price Index (CPI) rebasing in HICS 2015-16 and accordingly to control variation in consumption which is relatively more significant in urban areas. However, the over-representation has been adjusted in the survey by giving higher weights to rural households (National Poverty Report 2015-16).

The budget shares and price that has been used in the present study consists of eighteen food groups i.e. beef and mutton, chicken, seafood, milk and yogurt, eggs, fruits and dry fruits, vegetables, sugar and sweet products, spices, edible oil and ghee, hoteling & home delivery of food, tea and coffee, soft drinks and bottled water, wheat, rice, pulse bakery products, and miscellaneous food items.

Furthermore, some demographic/socioeconomic indicators have also been used to analyze their role in determining the demand for various food items; these are described as under:

i. **Age of Household Head**
    It would help analyze whether the age of the household head plays any role in determining the consumption pattern of the household.
ii. **Region**
    It helps in distinguishing the differences in household's consumption behavior in rural and urban areas. It is a binary variable where 1 represents households belonging to rural areas and 0 for the households belonging to urban areas.
iii. **Dependency ratio**
    In economic literature, the dependency ratio is calculated as the percentage of population below the age of 15 along with the population above the age of 65 (Leff, 1969). However, in developing countries like Pakistan, where more than 60% of the population lives in rural areas and children contribute to the labor force as helper during cultivation, harvesting of crops and taking care of livestock and in extreme cases as child labor. Furthermore, many people belonging to the working-age population are unemployed. Therefore, it seems appropriate that instead of imposing age restriction; the earning status of the household member may be considered while calculating dependency. Hence, the dependency ratio is calculated as

Dependency Ratio = (Household Size – Number of Earners) / Household Size

iv. House ownership

Due to increased rents in urban areas, the ownership of the house gives some additional income to the household in the shape of money that would have to be spent on rent. It is a binary variable that takes the value of 1 if the household is living in his/her own house and 0 if otherwise.

v. Education

As the household head is responsible for taking the decision of allocation of resources for expenditure on food products, therefore, his/her education is most relevant. The present study has used the education of household head in four different categories i.e. no formal education, below secondary, secondary and degree or higher. Based on these categories binary variables have been created.

There are certain issues in measuring the expenditures and calculation of prices. The first and most common issue is that being an agricultural-based economy; in rural areas of Pakistan, many households grow parts of food items on their lands. Furthermore many households purchase certain food items like wheat, rice, etc. in bulk amount. This results in a mismatch between the household's consumption and expenditure. However, in the HICS data, quantity and price of any given food item will fall one of the following heads:

a) Paid and consumed.
b) Wages and salaries in kind and consumed.
c) Own produced and consumed.
d) Receipt from assistance, gift, or other sources

In the present study, we have added up all the forms of consumption that households made against the different commodities.

The second and most relevant issue is the calculation of prices. In the dataset, both the value and quantity of consumed food items have been provided. We can find that a household has spent Rs. 500 on the purchase of 10 Kg of wheat. Dividing the amount spent by the quantity we can calculate the prices. $P_i = \dfrac{E_i}{Q_i}$, where pi is the price of ith good and E_i, is the expenditure on purchase of ith good and Qi is the quantity of ith good.

However, as mentioned earlier in the present study we had grouped the food items in eighteen different categories. It suggests that we have to use a weighted price for each commodity group. It is done by weighing each of the food items in a certain group according to its share in the category. The weighted price of each commodity group is the sum of the weighted prices of the different commodities in that group. Hence for any particular group (g) comprising of n items, the price (Pg) is defined as

$$P_g = \sum_{i=1}^{n} P_i \frac{w_i}{\sum_{i=1}^{n} w_i}$$

Where w_i is the share in the group.

4. ESTIMATION RESULTS

In the first step, a descriptive analysis has been conducted. The descriptive statistics of the selected variables is presented in Table 1.

Table 1 indicates that on average a household spends an amount of PKR 352,224 per annum on different goods. However, the lowest annual expenditure is recorded as low as PKR 21,054 while the maximum expenditure is PKR 5,943,948 per annum. On average, out of total expenditure, 30% is spent on food items. The average food expenditure is PKR 106,113.

In the food group, the highest budget share is of wheat & flour followed by Milk and Yogurt and Edible Oil and Ghee. On average these three food groups capture 50% of household total expenditure on food items. As far as demographic characteristics are concerned, the table suggests that of the surveyed households, 37% are uneducated and only 2% of the households are having education of degree or higher level. The dependency ratio is calculated as 0.71 indicating that on average 71% of members in households are dependents. It is also evident from Table 1 that 78% of households are having house ownership. It has also been found that 33% of households are living in rural areas. The average age of the household head emerged as 46 years.

As mentioned earlier, the QAIDS demand system has estimated, dependent variables are the share of different food groups, from the total food expenditure. The explanatory variables are prices of the food groups along with selected demographic and socioeconomic characteristics of the households. As a first step, the income (expenditure) elasticities have been calculated and summarized in Table 2.

All the elasticities reported in Table 2 have positive values, reflecting that all the selected commodity groups represent the normal goods, wherein an increase of food expenditures or income results in an increase in demand and vice versa.

As expected the highest income elasticity has been observed in the hoteling and home delivery of foods like pizza etc. followed by fruits & dry fruits, soft drinks & bottled water and bakery products; their elasticities are much higher and are close to 2 and these commodities groups are referred as luxury food items. Furthermore, income elasticities of all three categories of meat i.e. beef & mutton, chicken and seafood are greater than 1 it suggests that meat is also a luxury foods in Pakistan. However, in the meat group chicken is having relatively low-income elasticity.

TABLE 1
DESCRIPTIVE STATISTICS

Variable	No. of Observations	Mean	Standard Deviation	Minimum	Maximum
Total Expenditure	24153	352,224	280,327	21,054	5,943,948
Food Expenditure	24153	106,113	58,622	1,200	1,490,760
Budget Share of food commodity groups in food expenditure					
Beef and Mutton	24153	0.04	0.06	0.00	0.65
Chicken	24153	0.03	0.02	0.00	0.34
Sea Food	24153	0.01	0.02	0.00	0.33
Milk and Yogurt	24153	0.17	0.08	0.00	0.70
Eggs	24153	0.01	0.01	0.00	0.13
Fruits and Dry Fruits	24153	0.03	0.02	0.00	1.00
Vegetables	24153	0.07	0.03	0.00	0.30
Sugar and Sweet products	24153	0.04	0.02	0.00	0.38
Spices	24153	0.03	0.02	0.00	0.19
Edible Oil and Ghee	24153	0.11	0.04	0.00	0.59
Hoteling & home delivery of food	24153	0.06	0.09	0.00	1.00
Tea and Coffee	24153	0.04	0.02	0.00	0.31
Soft Drinks and Bottled Water	24153	0.01	0.02	0.00	0.27
Wheat	24153	0.21	0.10	0.00	0.69
Rice	24153	0.05	0.04	0.00	0.48
Pulse	24153	0.04	0.02	0.00	0.27
Bakery Products.	24153	0.02	0.02	0.00	0.33
Miscellaneous Food items	24153	0.02	0.04	0.00	0.49
Level of Education					
No formal Education	24153	0.37	0.2060	0	1
Below Secondary	24153	0.28	0.4496	0	1
Secondary	24153	0.33	0.4709	0	1
Degree or Higher	24153	0.02	0.1399	0	1
Dependency Ratio	24153	0.71	0.2600	0	1
House Ownership	24153	0.78	0.4128	0	1
Region	24153	0.33	0.4709	0	1
Age of Household Head	24153	46.15	13.14116	11	99

TABLE 2
ESTIMATED INCOME (EXPENDITURE) ELASTICITIES

Food Groups	Average Elasticities
Beef and Mutton	1.722
Chicken	1.353
Sea Food	1.787
Milk and Yogurt	0.209
Eggs	1.008
Fruits and Dry Fruits	3.092
Vegetables	0.490
Sugar and Sweet products	0.985
Spices	0.239
Edible Oil and Ghee	0.375
Hoteling & home delivery of food	7.000
Tea and Coffee	0.491
Soft Drinks and Bottled Water	2.362
Wheat	0.201
Rice	0.461
Pulse	0.793
Bakery Products.	1.851
Miscellaneous Food items	2.181

Eggs, sugar & sweets and pulses are having the elasticities less than one but are close to the 1 and therefore, they appeared as necessity goods. In the necessity goods group there are tea and coffee, vegetables, rice and edible oil & ghee, elasticities of these commodities groups are hovering around 0.4. However, the elasticities of spices, milk and yogurt, and wheat are around 0.2 and close to zero and we can call these commodities groups as sticky food items. For these goods, if a household's income decreases or increases; the proportion of expenditure on these commodity groups hardly changes.

The study has also calculated 'own' as well as 'cross-price' elasticities for the famous Marshallian (uncompensated) demand function. The Marshallian demand function has been derived by adopting the maximization of utility function is subject to budget constraint. The calculated price elasticities are presented in Table 3. In the table, the own-price elasticities of selected food groups are in the diagonal of the matrix. The own-price elasticity measures the percentage change of demand in the commodity group due to 1% change in the price of that commodity group. It is pertinent to mention here that all the own-price elasticities are having a negative sign confirming the negative relationship between price and quantity demanded. The price elasticities of beef & mutton, seafood, eggs, and soft drinks are greater than 1, revealing that demand for these goods is elastic and higher percentage changes in demand would occur in comparison to the change in price. The demand for other food groups is less 1 revealing that their demand is less elastic. The result also reveals that demand for tea & coffee (–0.22) followed by chicken (–0.37) and pulses (–0.37) are having the lowest

TABLE 3
UNCOMPENSATED PRICE ELASTICITIES

	Beef and Mutton	Chicken	Sea Food	Milk and Yogurt	Eggs	Fruits and Dry Fruits	Vegetables	Sugar and Sweet products	Spices	Edible Oil and Ghee	Hoteling & home delivery of food	Tea and Coffee	Soft Drinks and Bottled Water	Wheat	Rice	Pulse	Bakery Products.	Miscellaneous Food items
Beef and Mutton	**-2.029**	0.704	-0.165	-0.254	-0.157	-0.043	-0.378	-0.149	-0.086	-0.401	-0.386	-0.450	-0.087	-0.171	-0.305	-0.323	-0.115	-0.137
Chicken	0.721	**-0.365**	-0.150	0.015	-0.307	-0.049	-0.078	-0.099	-0.006	-0.061	-0.192	-0.048	-0.171	-0.127	0.022	-0.088	-0.051	-0.065
Sea Food	0.766	0.686	**-2.688**	-0.152	-0.216	-0.017	-0.469	-0.192	-0.011	-0.271	-0.167	-0.280	-0.428	-0.099	-0.002	-0.138	-0.029	-0.027
Milk and Yogurt	0.038	0.054	-0.002	**-0.872**	0.011	0.045	-0.028	0.025	0.002	0.013	0.031	0.036	0.017	0.091	0.052	0.020	0.036	0.038
Eggs	-0.425	-0.818	-0.126	0.023	**-1.192**	-0.029	-0.005	-0.102	0.033	-0.045	-0.084	-0.367	-0.248	-0.151	-0.073	-0.191	-0.009	-0.015
Fruits and Dry Fruits	-0.150	-0.119	-0.008	-0.102	-0.026	**-0.881**	0.008	-0.134	0.013	-0.113	-0.347	-0.156	-0.023	-0.408	-0.125	-0.069	-0.101	-0.207
Vegetables	-0.094	-0.003	-0.033	0.001	0.004	0.017	**-0.529**	-0.019	-0.008	-0.007	-0.004	0.046	-0.024	0.064	0.014	-0.022	0.006	0.027
Sugar and Sweet products	-0.053	-0.033	-0.021	-0.011	-0.017	-0.025	-0.059	**-0.678**	-0.018	-0.018	-0.036	-0.034	0.016	-0.002	-0.002	-0.068	-0.002	0.014
Spices	-0.039	0.022	0.000	0.117	0.017	0.026	-0.018	-0.006	**-0.789**	0.048	0.007	0.012	0.039	0.043	0.057	-0.022	0.031	0.056
Edible Oil and Ghee	-0.021	0.032	-0.010	0.028	0.005	0.028	-0.027	0.018	-0.002	**-0.776**	0.020	0.032	-0.001	0.098	0.026	0.023	0.026	0.046
Hoteling & home delivery of food	-0.910	-0.557	-0.054	-0.679	-0.103	-0.561	0.045	-0.357	0.058	-0.380	**-0.644**	-0.324	-0.263	-1.601	-0.596	-0.195	-0.406	-0.707
Tea and Coffee	-0.168	0.023	-0.029	0.060	-0.062	-0.007	0.033	-0.014	-0.013	0.033	0.027	**-0.218**	-0.070	0.103	0.102	-0.088	0.025	0.067
Soft Drinks and Bottled Water	-0.458	-0.676	-0.321	-0.281	-0.333	-0.077	-0.321	-0.024	0.114	-0.407	-0.450	-0.670	**-1.521**	-0.794	-0.193	-0.204	-0.163	-0.283
Wheat	-0.052	-0.036	-0.001	0.001	0.003	0.028	-0.019	0.020	-0.016	0.004	0.028	0.022	0.009	**-0.870**	0.023	-0.015	0.020	0.049
Rice	-0.035	-0.079	0.004	0.063	0.001	0.044	-0.036	0.026	-0.002	-0.010	0.012	0.088	0.022	0.096	**-0.828**	-0.047	0.040	0.052
Pulse	-0.174	-0.034	-0.017	0.052	-0.041	-0.010	-0.059	-0.073	-0.023	0.047	-0.045	-0.107	-0.023	0.079	-0.070	**-0.367**	-0.003	0.024
Bakery Products.	-0.148	-0.056	-0.008	-0.025	-0.004	-0.050	-0.053	-0.035	0.011	-0.047	-0.141	-0.024	-0.028	-0.202	-0.030	-0.040	**-0.897**	-0.047
Miscellaneous Food items	-0.051	-0.005	-0.002	-0.137	0.003	-0.041	-0.026	0.012	0.005	-0.034	-0.091	0.034	-0.012	0.003	-0.031	0.006	-0.001	**-1.003**

TABLE 4

DEMOGRAPHIC & HOUSEHOLD'S CHARACTERISTICS AND DEMAND OF THE FOOD

	Beef and Mutton	Chicken	Sea Food	Milk and Yogurt	Eggs	Fruits and Dry Fruits	Vege-tables	Sugar and Sweet products	Spices	Edible Oil and Ghee	Hoteling & home delivery of food	Tea and Coffee	Soft Drinks and Bottled Water	Wheat	Rice	Pulse	Bakery Pro-ducts.	Miscella-neous Food items
Region/place of residence	-0.0012*	-0.0005*	-0.0003*	0.0012*	-0.0005*	-0.0008*	-0.0005*	0.0010*	-0.0011*	-7.7700	-0.0103*	0.0013*	-0.0007*	0.0077*	0.0016*	0.0003*	-0.0010*	0.0039*
Dependency Ratio	-0.0017*	-0.0006*	-0.0003*	0.0009*	-0.0003*	-0.0014*	-0.0018*	-0.0003*	-0.0006*	-0.020*	-0.0063*	0.0008*	-0.0003*	0.0023*	0.0011*	-0.0015*	-0.0004*	0.0037*
House Ownership	0.0002	0.0002*	-0.0001*	-0.0023*	-0.00001	-0.0004	0.0005*	-0.0002*	-0.0001	0.0005*	0.0038*	0.0002*	-0.0002*	0.0001	-0.0001	0.0004*	-0.0002*	-0.0013*
Age of Household Head	0.0002*	-0.0003	-0.0003*	0.0001*	0.0002*	-0.0007*	-0.0013*	-0.0002*	-0.0004*	-0.0018*	-0.0050*	0.0002*	-0.0001*	-0.0013*	0.0008*	-0.0015*	0.0004*	0.0023*
Education																		
No formal Education								Omitted										
Below Secondary	0.00004	-0.0006*	-0.0001*	-0.0026*	-0.0003*	-0.0008*	0.00004	0.0003*	-0.0003*	0.0001*	-0.0013*	0.0005*	-0.0004*	0.0053*	-0.0002	0.0004*	-0.0008*	0.0006*
Secondary	-0.0008*	-0.0020*	-0.0004*	-0.0028*	-0.0009*	0.0018*	0.0007*	0.00002	-0.0008*	0.0017*	-0.0051*	0.0005*	-0.0010*	0.0139*	-0.00003	0.0008*	-0.0022*	-0.00001
Degree or Higher	-0.0004*	-0.0032*	-0.0012*	-0.0001*	-0.0015*	0.0031*	-0.0004*	-0.0006*	-0.0016*	0.0030*	-0.0133*	0.0009*	-0.0026*	0.0250*	0.0023*	0.0008*	-0.0037*	-0.0009

* P-value<0.05 ** P-value<0.10

price elasticities. It suggests that in Pakistan there is a strong preference for tea & coffee and there is a very limited impact of prices on its demand.

The values other than diagonal of the matrix are cross-price elasticities measuring the change in demand of selected commodity groups due to a 1% change in prices of the other commodity groups. Here negative sign is the indicator of complementary commodity groups and the positive sign is the indicator of substituent commodity groups. For example, beef and meat have positive cross-price elasticities for chicken, seafood and milk & yogurt revealing that these goods are substitutes for beef & mutton. However, for the rest of the groups, there is a negative sign of cross-price elasticities suggesting that these are complementary goods to beef & Mutton.

As mentioned earlier, role of various household factors in affecting the demand for different food items has also been analyzed. The estimated coefficients of demographic factors are presented in Table 4.

The results presented in Table 4 suggest that the place of residence (living in urban or rural areas) has a significant impact on the demand for different food items. The results indicate that people living in rural areas of Pakistan tend to have a significantly higher share of milk & yogurt, sugar, tea, and pulses. They also have a higher share in the consumption of wheat and rice in comparison to urban households. It is important to clarify here that there is a likelihood that the monetary value of the specific expenditure of the urban household may be larger but when expressed in shares the values of rural household are greater because of their low income.

The results also confirm that the dependency ratio significantly hurts a household consumption of most of the food items, however, it has been found that with a high dependency ratio, household's consumption share of milk & yogurt, tea & coffee, wheat, and rice has significantly increased.

The ownership of the house is also having a significant impact on the consumption of comparatively luxurious food items like beef, mutton, chicken and hoteling. The ownership of the house not only has a significant positive impact on the share of these food commodities but also on the share of vegetables, pulses, edible oil& ghee tea & coffee and wheat which significantly increased.

The study has also found that the age of household head plays a significant role in determining household expenditures on different food commodity groups. The results reveal that with an increase in the age of household head the share of beef & mutton, milk & yogurt, eggs, tea & coffee, pulses, and bakery products has significantly increased.

As expected education also plays a significant role in determining the household's behavior for consuming certain food items. It has been found that households headed by more educated ones are associated with higher shares of fruits & dry fruits, vegetables, edible oil & ghee, tea & coffee, wheat, and pulses.

5. CONCLUSION AND RECOMMENDATIONS

The analysis of the determinants of food demand and estimation of elasticities provides vital information regarding the consumption behavior of society in general especially with respects to income and prices. Because of the rapid urbanization and globalization Pakistani society is experiencing socio-economic transformation. It has resulted in increased demand for value-added and branded products and a decline in demand for traditional products. Furthermore, because of the high population growth rate food shortages and an increase in their prices are a repeated phenomenon in Pakistan. It has serious precautions for food security, as the Hunger Index has already indicated the prevalence of hunger and malnourishment in Pakistan (Nazli *et al.*, 2012). Keeping in view the significance of food demand analysis, present study has attempted to analyze the household food demand and its major determinants in Pakistan by estimating the Quadratic Almost Ideal Demand System (QUAIDS) model on Household Integrated Income and Consumption Survey (HIICS) 2015-16. By estimating price elasticities, the study has answered the question that; how an increase in prices will affect the demand for certain commodities?

Based on the income elasticities it has been found that all selected food groups are normal goods. It has been further found that in Pakistan hoteling, fruits &dry fruits, soft drinks & bottled water, bakery products, beef & mutton, chicken and seafood are luxury goods. It has serious implications for malnutrition because for the majority of the households fruits and meat (the major source of vitamin and protein) are luxury food items. It suggests poor dietary practices in Pakistan because eating healthy food is not the priority, resultantly; anemia, calcium and vitamin D deficiency is reaching its one of the highest. The price elasticities of beef & mutton, seafood are highly elastic. Eggs, sugar & sweets, pulses tea and coffee, vegetables, rice, and edible oil & ghee are necessity goods. Spices, milk and yogurt and wheat are close to sticky food items.

The study has also calculated the own as well as cross-price elasticities (uncompensated/ Marshallian) price elasticities. The price elasticities suggest that demand for beef & mutton, seafood, eggs, and soft drinks is elastic. The demand for other food groups is less than 1 revealing that their demand is less elastic. It has also been found that demand for tea & coffee is least elastic revealing that prices of tea have a very marginal impact on its demand. During FY 2017-18 Pakistan has imported tea valuing around USD 400 million[1]. Furthermore, according to FAO Pakistan is among the seven countries where per capita consumption of tea has increased during the last few years[2].

The study has found that the residence of the households, dependency ratio (ratio of the dependents in the households), living in the own house, the age of the household head and level of education of household head plays a significant

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[1]   Economic Survey of Pakistan 2017-18.
[2]   https://www.dawn.com/news/1415762.

role in determining the demand for different food commodities. The study has also concluded that with ownership of the house, share of consumption of comparatively luxurious food items like beef, mutton, chicken, and hoteling has significantly increased. It suggests that provision of houses will not only be helpful in providing shelter to the people but it would also be significant in raising the nutrition level of these people. Therefore, it is recommended that the government should prioritize the "Naya Pakistan Housing project" and link it with the efforts of poverty reduction and meeting Sustainable Development Goals (SDGs). The study has concluded that with an increase in age of household head the share of beef & mutton, milk & yogurt, eggs, tea & coffee, pulses, and bakery products has significantly increased. Households headed by more educated ones are associated with higher shares for fruits & dry fruits, vegetables, edible oil & ghee, Tea & Coffee, wheat and pulses. It reflects that aged, as well as well-educated household heads, are more concerned with the nutrition of the food. Hence, education is the key to achieve the goal of health and eradicating malnutrition and poverty in Pakistan.

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