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An Analysis of Food Insecurity in Pakistan: Prevalence of Undernourishment (PoU) and Food Insecurity Experience Scale (FIES)

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Abstract

This study covers only SDG target 2.1 (2.1.1-Prevalance of Undernourishment and 2.1.2-Food Insecurity Experience Scale). Though FAO is the custodian organization for estimating these targets across the globe, however, it is the first ever attempt for estimating these targets by PARC-MNFS&R. HIES data for the year 2018-19 has been used for estimation of these targets and compared with the results of HIES-2015-16 estimated by FAO. According to the results 18.38 percent households are undernourished in Pakistan and this situation is worse in urban areas (23.43%) compared with rural areas (16.61%). Punjab has highest proportion of undernourished individuals/households with 21.48 percent followed by Sindh province with 17.40 percent households. Khyber Pakhtunkhwa has the lowest proportion of 12.67 percent and Baluchistan with 16.95 percent households. National level results of FIES supports the results of PoU except urban/rural order. According to FIES results, about 16 percent of the households (individuals) are moderate and/or severe food insecure with more than 02 percent as severe food insecure in Pakistan. Sindh province shows highest proportion with more than 19 percent followed by KP province with nearly 17 percent

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households as moderate and severe food insecure. However, highest proportions of more than 03 percent households were found as severe food insecure in Punjab province. In conclusion Pakistan has shown tremendous achievements towards the Zero Hunger Targets by 2030, however, more efforts are needed for sustainable agriculture and food system in order to address the food insecurity level through better access and availability of food. Awareness campaign about healthy and nutritious food intake, and measures for adoption of dietary guidelines are recommended for preventing undernourishment.

1. Introduction

Food security, as defined by the Committee on World Food Security of United Nations' as, "all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life". For last three decades, the concepts of food security have appeared to imitate modifications in official policy thinking (Clay, 2002; Heidhues et al., 2004). The definition of food security was confined to the availability of food along with stability of price of the essential food item that was initiated in the mid-1970s, during the World Food Conference in 1974. This definition was "Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices".

Later on Food and Agriculture Organization (FAO) paying attention towards balancing the equation of food demand and supply and new definition of Food Security was raised as "Ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 1983). FAO revised this definition in food security analysis further by including individual and household level, in addition to regional and national level of aggregation. The highly significant report on Poverty and Hunger by World Bank Report (World Bank, 1986) focused on temporal dynamics of food insecurity (Clay, 2002). The World Bank report is pioneered in introducing the differences among chronic food insecurity that is caused by low income and/or structural poverty and transitory food insecurity. This was supplemented by Sen's theory of famine (1981) who stressed on the effect of personal entitlements to food access i.e., labor, production, , trade and transfer based resources.

The most acknowledgeable definition of food security of World Food Summit (1996) fortifies on multidimensional nature of food security that includes all pillars of food security like, food availability, access to food, utilization and stability. This definition enabled policy makers to focus on the promotion and recovery of livelihood choices, that primary introduced by Chambers and Conway (1992), an academician. Developmental programs of the international organizations now revolve around

livelihood approaches. According to Devereux (Devereux 2000), food insecurity as a social and political construct has textured the present for analysis leaving the link among food security, starvation and crop failure in past.

Many different indicators have been used during the last 30 years to provide information on household food insecurity, but none existed that combined the properties of validity, reliability and cross-country and over-time comparability. In 1995, the Household Food Security Survey Module (HFSSM) was applied on a nationally representative sample of the US Population in the Continued Population Survey and the responses to the 18 questions it comprised, analyzed through the lenses of the Rasch measurement model firstly to obtain a proper measure of the severity of the food insecurity condition, defined as inability of households or individuals to access food, owing to money shortage or other resources commonly devoted to it. However, climate change, increasing population pressure, souring the prices of food and environmental stresses will not have insignificant impact on food security in the coming decades. Many adaptation and mitigations strategies and policy measures are needed to respond global climate changes like optimal allocation of water and land resources, managing food losses and wastage, trade of food, processing of food and prices of food. In this regards International Food Policy Research Institute (IFPRI) has worked on different dimensions of food security covering, promotion of sustainable agricultural technologies analysis of cash transfers, building resilience to shocks, and trade-offs management in food security.

1.1 Prevalence of Undernourishment- PoU (SDG indicator 2.1.1):

PoU is an estimate and refers to that population's proportion that have habitual food consumption providing insufficient dietary energy levels required for maintaining a normal active and healthy life. Sukhatme (Sukhatme, 1961) originally proposed to monitor food security by estimating the prevalence of undernourishment in the population based on two new ideas: i) part of the variability observed in food consumption has nothing to do with food insecurity, as it reflects the normal variability due to differences in food requirements; ii) it is not just a matter of availability but also of access to food.

Application of Sukhatme method becomes possible for most countries where household surveys including food consumption module.

1.2 Food Insecurity Experience Scale – FIES (SDG indicator 2.1.2):

On the other hand, FIES is food insecurity measure centering experience-base and mainly encompasses direct responses of the people to questions about their experiences in the past one year who face problems in access to food. Food and Agriculture Organization (FAO) under Voice for Hungry project developed analytical techniques to measure experience-based food security measurements. These techniques made it viable to compare the rate of food insecurity prevalence not only across countries but even also

at sub-national level. These techniques produce: meaningful and reliable information on the adequacy of food access at the individual or household level, is direct measure of food insecurity experienced by people and households, easily applicable to less expenditure within any individual or household survey, and provides actionable information that policy makers can use to identify vulnerable population groups and guide policy interventions when applied to large population survey.

2. Methodology

This section describes sources of data, techniques and methods used for analysis of the data.

Data and Sources:

HIES data for the year 2018-19 was used for this study. Beside this, numerous data set have been used for the analysis. HIES data covers only age but no height. For calculating Body Mass Index (BMI), height data is pre-requisite and this data was drawn from Pakistan Demographic and Health Survey, 2017-18. For calories and other nutrients distribution Pakistan Dietary Guidelines for Better Nutrition developed by Planning Commission of Pakistan-2018 were used.

PoU Estimation:

Estimation of PoU is a cumbersome process and involved a lot of complicated analysis and large dataset. It is not only handling the large data set of more than 25000 households but also handling nutritional data, reference value for dietary energy requirements of all classes of age simultaneously. For calculation of all these required figures following steps and assumptions are generated.

Dietary Energy Intakes and Requirements:

The energy amount required for living a long-term active and healthy life is called Dietary Energy Requirements. Any individual is considered to be undernourished if the energy intake level of his/her habitual dietary is less than the minimum dietary energy requirement assumed to be appropriated by nutritionists. Similarly for a group of individuals there is a range of energy requirements that are compatible with long-term good health and also there are so many other factors like, age, physiological status, gender, body weight and lifestyle that affect energy requirements.

Probability Distribution Framework:

There is difference between energy requirements and actual intake. The estimation of the undernourished in a population cannot be viewed as a simple accounting exercise involving the comparison of the observed household Dietary Energy Consumption (DEC) with the estimated household Dietary Energy Requirement (DER), and counting the individuals in the households with such that dietary energy consumption is less than dietary energy requirement (DEC < DER).

Probability Distribution of DER:

There are two types of probability distribution. One, for individual within population group – that how the energy requirement of individuals is distributed within a population that is represented by a probability distribution where the values of energy requirement are associated to a probability of occurrence. And second, each population group has its own probability distribution of dietary energy requirements.

Probability Distribution of Dietary Energy Intake:

Now again individual within population group for dietary energy intake that how the dietary energy intake (DEI) of individuals is distributed within population represented by a probability distribution where values of dietary energy intake are associated to a probability of occurrence is different from that each population group has its own probability distribution of dietary energy intake.

Prevalence of Undernourishment (PoU):

Now PoU can be represented by the following equation and Figure-1.

$$PoU = \int_{x<MDER} f(x|DEC; CV; SK)dx \quad (1)$$

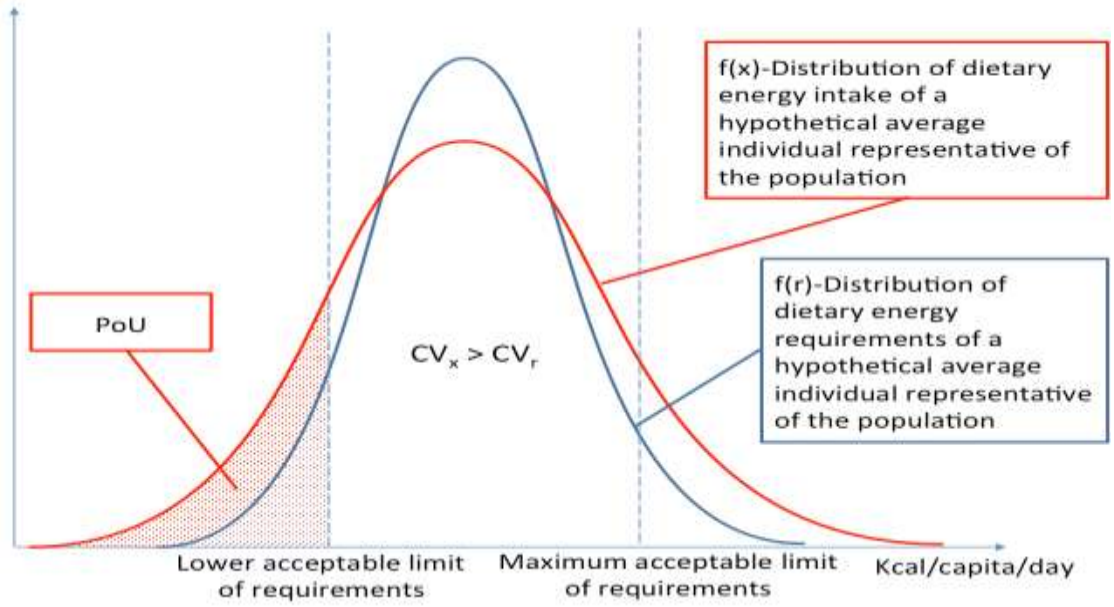


Figure-1: Distribution of PoU

It is depicted from the above figure that within a probability distribution framework, the prevalence of undernourishment (PoU) is the probability that a randomly selected individual from a population has habitual access to food which does not provide the dietary energy necessary to cover his/her habitual energy requirements. It is just an estimate and not a direct measure but shows individuals proportion in a population that

suffering from chronic hunger (a state, lasting for at least one year, of inability to acquire enough food to satisfy the energy requirements).

FIES Estimation:

For the first time Pakistan Bureau of Statistics incorporated a separate section (Section 5b) in HIES data for the year 2018-19 to capture data on Food Insecurity Experience Scale (FIES). This section covers all the basic 8 questions of the FIES Survey Module based on respondent reply with dichotomous (yes/no) responses on food insecurity experience during last 12 months. This report is based on the HIES 2018-19 data set. The 8 questions included at section 5b of HIES 2018-19 are:

During the last 12 MONTHS, was there a time when:

1. You were **worried you would run out of food** because of a lack of money or other resources?
2. You were **unable to eat healthy and nutritious food** because of a lack of money or other resources?
3. You **ate only a few kinds of foods** because of a lack of money or other resources?
4. You **had to skip a meal** because there was not enough money or other resources to get food?
5. You **ate less than you thought you should** because of a lack of money or other resources?
6. Your **household ran out of food** because of a lack of money or other resources?
7. You **were hungry but did not eat** because there was not enough money or other resources for food?
8. You **went without eating for a whole day** because of a lack of money or other resources?

The Model:

Rasch (Rasch, 1960) developed a model based on the theory of latent response. This model states to a family of mathematical models that attempt to describe the association between latent traits (unobservable characteristic or attribute) and their manifestations (i.e., observed outcomes, responses or performance). This model is said to be foundation of the item response theory and has been used to capture the food insecurity experience based on dichotomous response of yes and no. Rasch Model is an inimitable method of mathematical modeling centered upon a latent trait and accomplishes stochastic (probabilistic) conjoint additivity (conjoint means measurement of persons and items on the same scale and additivity is the equal-interval property of the scale).

Mathematically, Rasch Model is equal to Single Parameter Logistic Model, though, Rasch Model constrains the Item Discrimination to 1, while the 1-Parameter logistic model strives to fit the data as much as possible and does not limit the discrimination factor to 1. The Rasch Model is considered superior due to its more concerning with

developing the variable which is being used for measuring the dimension of interest. Therefore, when constructing an instrument fitting, the Rasch Model would be best, improving the precision of the items.

Rasch model implies that raw score (i.e., simple sum of affirmative responses) has adequate statistic to measure severity of respondents' - As both affirming an item and denying it convey information individual measures of severity depend on the number of affirmed items, not on which particular set of items have been affirmed. Unexpected patterns, however, contribute to determine measures of mis-fit, used to test the empirical validity of the model - Use of raw score for classification greatly facilitates use of the method, but it is only legitimate if data conform to the model's assumptions of equal discrimination of all item and conditional independence of the responses to each item.

Conditional Maximum Likelihood (CML) can be used to estimate parameters.

- It imposes no assumption on the shape of the distribution of the latent trait in the population (+)
- Provides consistent estimates of standard errors under the Rasch model assumptions (+)
- It only uses non-extreme response patterns, as severity parameters for zero or maximum raw score cannot be estimated. If items are not adequately chosen, this may limit the size of effective samples.

$$Prob(X_{i,j} = 1) = \frac{\exp(a_i - b_j)}{1 - \exp(a_i - b_j)} \quad (2)$$

- It is the foundation of **Item-Response Theory**
- $X_{i,j} \in \{0,1\}$ is the "response" of the *i*-th respondent to the *j*-th "item".
    - The probability that a respondent whose position on a scale is a_i might respond to an item positioned at $b_j$on the same scale is a (logistic) function of the difference $(a_i - b_j)$
    - The model provides the probabilistic basis for Estimating the parameters associated with both items and respondents and for conducting statistical tests of the strength of association of the responses to the latent trait and of goodness of fit

Rasch Model has has unique properties i.e., (i) Raw score is a **sufficient statistic** for the latent trait measure. It means that two respondents with the same raw score but different response patterns will be assigned the same measure (even though the absolute error around the measure may differ), (ii) Respondent parameters form an **interval scale** on the latent trait metrics. These properties are subject to assumptions of (i) Infit Statistic in the range 0.7 – 1.3, (ii) High Rasch reliability measures and (iii) No correlation among "residuals".

3. Results and Discussion:

Prevalence of Undernourishment:

Estimation of PoU is a cumbersome process and FAO is custodian for its estimation across the globe and rarely it is estimated by local experts. Table-1, as following divulges the results of the Prevalence of Undernourishment in Pakistan. According to the results 18.38 percent households are undernourished in Pakistan and this situation is worse in urban areas (23.43%) compared with rural areas (16.61%). The provincial picture is interesting as depicted from Table-1 that Punjab has highest proportion of undernourished individuals/households with 21.48 percent followed by Sindh province with 17.40 percent households. Khyber Pakhtunkhwa has the lowest proportion of 12.67 percent and Baluchistan with 16.95 percent households.

The order of provincial and nation rural/urban undernourished households though is not too much different from the results of 2015-16, however, the country has shown commendable achievements in catering poverty and undernourishment. During the past three years Pakistan has made improvement achieving food security by lowering the proportion of undernourished households from 22.12 percent (FAO results based on 2015-16 data) to 18.38 percent. Similarly, Punjab has shown improvement by lowering the proportion of undernourished from 23.05 percent to 21.48 percent, Sindh from 26.12 percent to 17.40 percent. The food insecurity status of the country was on increasing trend since 2008 as reflected from FAO results. PoU was 21.8 in 2008, increased to 21.9 during 2010 to 2013 and further boosted to 22.12 during 2014 to 2016 (FAO, 2016). However, the score dropped to 18.38 as per this report results, indicates that Pakistan has done nicely to overcome the issue of food insecurity by reducing the proportion of undernourished people.

Table-1: National and Provincial Estimates of PoU

Province	Region	DEC	Min. Dietary Energy Requirement	Avg. Dietary Energy Requirement	Max. Dietary Energy Requirement	PoU 2018-19
Punjab	Overall	2141	1723	2220	2637	21.48
Sindh	Overall	2191	1732	2233	2650	17.40
KP	Overall	2216	1672	2149	2550	12.67
Baluchistan	Overall	2084	1701	2190	2595	16.95
Pakistan	**Overall**	**2162**	**1715**	**2209**	**2623**	**18.38**
Pakistan	Urban	2142	1754	2266	2696	23.43
Pakistan	Rural	2174	1692	2176	2581	16.61

Source: Author's own estimation

Food Insecurity Experience Scale:

Sustainable Development Goal (SDG)-2 related to Zero hunger and 2.1.2 being its sub indicator is based on Food Insecurity Experience Scale (FIES). Data set on FIES

indicators was not available so far in Pakistan, however, Pakistan Bureau of Statistics included these indicators in its HIES data set for the year 2018-19. Based on HIES data set FIES was estimated and the results are presented in the following sections.

Reliability of Residual Correlation:

All 08 questions as mentioned in section 2.2 were analyses and were checked for their reliability over residual correlation. The results are given in Table-2, which depicts that residual correlations are in normal range and no additional dimension is captured by the FIES data. This is visible by the constant descending slope of the curve, without any sudden change of slope. It confirms the results of residual correlation matrix about the uni-dimensionality of the data. Rasch model reliability was found to be 79 percent.

Table-2: Reliability and Residual Correlation:

Rasch reliability = 0.79							
Residual correlation							
	Healthy	Fewfood	Skipped	AteLess	RunOut	Hungry	WholeDay
Worried	0.18	-0.05	-0.02	-0.14	-0.04	0.00	0.03
Healthy		0.26	-0.19	-0.09	-0.14	-0.11	-0.05
Fewfood			-0.07	-0.01	-0.11	-0.10	-0.07
Skipped				0.03	0.09	0.01	-0.05
AteLess					0.00	-0.00	-0.12
RunOut						0.42	0.42
Hungry							0.51

Source: Author's own estimation

Item Severity Parameters and Infit Statistics:

Item severity parameters show that the experience with the lower severity is accessing food considered "Healthy", followed by having to eat only "Few kinds of food" and being "Worried" the household would runout of food. The severity is gradually increasing up to the most severe experience, having not to eat for a "Whole day" owing to deficiency of money or other resources. The severity pattern makes sense and describes the process followed in Pakistan towards food insecurity. Infit statistics suggest that all items have equal weight in the measure of food insecurity and therefore they all can be kept in the scale for a proper measure of food insecurity.

Table-3: Item Statistics:

	Severity	**S.E.**	**Infit**	**S.E. Infit**	**Outfit**
Worried	-0.861	0.029	1.009	0.014	1.174
Healthy	-3.056	0.038	0.910	0.024	2.001
Fewfood	-2.715	0.035	0.995	0.021	2.392
Skipped	0.719	0.035	1.081	0.021	1.375
AteLess	-0.168	0.030	1.101	0.016	1.520
RunOut	1.735	0.043	0.757	0.029	0.998
Hungry	1.918	0.045	0.751	0.031	0.652
WholeDay	2.827	0.058	0.814	0.040	0.294
Total Number of Cases					24809

Source: Author's own estimation

Prevalence of Food Insecurity:

Table-4 to Table-6 divulges prevalence of food insecurity in Pakistan by household and individual level across urban and rural territories as well provincial break up. According to results about 16 percent of the households (individuals) are moderate and/or severe food insecure with more than 02 percent as severe food insecure. Sindh province shows highest proportion with more than 19 percent followed by KP province with nearly 17 percent households as moderate and severe food insecure. However, highest proportions of more than 03 percent households were found as severe food insecure in Punjab province.

Table-4: Prevalence of Food Insecurity by Household and Individual in Pakistan (%)

Prevalence rates of food insecurity (% of households)			
Moderate or severe	MoE	Severe	MoE
15.92	0.84	2.37	0.32
Prevalence rates of food insecurity (% of individuals)			
Moderate or severe	MoE	Severe	MoE
15.98	0.91	2.40	0.35

Source: Author's own estimation

Table-5: Prevalence of Food Insecurity by Urban and Rural Household/Individual in Pakistan (%)

Prevalence rates of food insecurity by urban/rural (% of households)				
	Moderate or Severe	MoE	Severe	MoE
Urban	9.22	1.12	1.24	0.40
Rural	19.96	1.14	3.05	0.46
Prevalence rates of food insecurity by urban/rural (% of individuals)				

	Moderate or Severe	MoE	Severe	MoE
Urban	9.33	1.21	1.28	0.44
Rural	19.72	1.23	3.04	0.48

Source: Author's own estimation

Table-6: Prevalence of Food Insecurity by Provincial Household/Individual in Pakistan (%)

Prevalence rates of food insecurity by province (% of households)				
	Moderate or Severe	MoE	Severe	MoE
Punjab	14.43	1.16	3.06	0.50
Sindh	19.51	1.77	1.55	0.47
Khyber Pakhtunkhwa	16.73	1.90	0.90	0.48
Baluchistan	15.18	2.72	2.05	0.95
Prevalence rates of food insecurity by urban/rural (% of individuals)				
	Moderate or Severe	MoE	Severe	MoE
Punjab	14.55	1.27	3.13	0.55
Sindh	19.36	1.94	1.75	0.55
Khyber Pakhtunkhwa	15.95	2.03	0.96	0.54
Baluchistan	16.47	3.18	2.31	1.14

Source: Author's own estimation

Raw and Diagnostic Statistics

Given infit statistics are in the acceptable range, the raw score can be considered an ordinal measure of food insecurity (the higher the raw score, the higher the severity). However, the estimate is associated to a measurement error that needs to be taken into account in the estimate of prevalence of food insecurity.

The two most discrepant items compared to the global standard are Worried and Healthy. One possibility to calibrate the Pakistani scale against the FIES global standard is to consider these two items "unique" to the metric of Pakistan, and not to use them in order to compute cross-country comparable thresholds of food insecurity.

Table-7: Raw Score

RS	Severity	Error
0	-4.177	1.576
1	-3.210	1.249
2	-1.906	1.096
3	-0.794	1.013
4	0.176	0.959
5	1.078	0.943
6	1.999	0.983
7	3.058	1.164
8	4.269	1.576

Source: Author's own estimation

Table-8: Absolute difference between country and global standard items

Worried	0.77
Healthy	0.69
Fewfood	0.26
Skipped	0.02
AteLess	0.20
RunOut	0.33
Hungry	0.17
WholeDay	0.50
Correlation between common items = 90.2 %	

Source: Author's own estimation

Table-9: Infit Statistics by Urban and Rural

	Urban	Rural
Worried	0.97	1.02
Healthy	0.87	0.93
Fewfood	1.03	0.97
Skipped	1.01	1.10
AteLess	1.08	1.11
RunOut	0.78	0.75
Hungry	0.75	0.75
WholeDay	0.89	0.79
Number of Cases	8873.00	15936.00

Source: Author's own estimation

Differential Item Functioning:

Differential Item Functioning (DIF) studies the possible different functioning of the scale across population characteristics. This would not be a good property of the scale, as the "measurement invariance" property asserts that the scale should function in the same way independently from the population sampled. In this case, we can conclude that there is no DIF across urban/rural contexts and the same scale can be used to measure food insecurity in these areas.

Table-10: Infit Statistics and DIF by Province

	Punjab	Sindh	Khyber Pakhtunkhwa	Baluchistan
Worried	1.04	0.89	1.18	0.86
Healthy	0.84	0.92	0.99	0.84
Fewfood	0.89	1.15	0.97	1.19
Skipped	0.90	1.41	1.05	1.11
AteLess	1.21	1.06	0.93	0.87
RunOut	0.77	0.57	0.90	0.77
Hungry	0.72	0.68	0.78	0.87
WholeDay	0.89	0.75	0.71	1.01
Number of Cases	11781.00	6216.00	4485.00	2327.00

Source: Author's own estimation

Conclusions and Recommendations

Agricultural profile of Pakistan is pretty well. Pakistan is ranked 2nd in production of indigenous oilseed, milk of buffalo and meat of buffalo, and, 3rd in cottonseed production and chilies , 4th in cotton lint, pulses, mango, goat milk, , roots and tubers, 5th in chickpeas and spices , 6th in wheat, spinach, sugarcane, apricot and dates, 7th in broccoli and cauliflower , 8th in onion, mandarin, tangerines and tobacco , 11th in oranges, pistachio and wools, 13th in rice, 14th in peas, eggs and birds' and and 15th in lentil production. Large population of the country exerts tremendous pressure on the available stock of food and fiber. Production or availability of food is not a serious issue in Pakistan, but its accessibility both physically (good example is milk; 50 percent surplus production) and economically (low income and high prices) is a matter of concern. PoU refers to physical access of food and its utilization. On the other hand, FIES scores insinuates economic access to food. In Pakistan about 75 percent of the calories are taken from three main sources (Wheat/rice about 50 percent, oil/ghee 15 percent and sugar about 10 percent). Consumption of these three commodities is not only unhealthy food but also deficit in required balanced food resultantly which causes prevalence of undernourishment and other diet related issues. The disaggregated side analysis of the food commodities divulge that international commodity prices did not affect domestic prices especially wheat and sugar, but supply demand gap causes prices to rise. The demand side causes of food inflation cannot be ignored but supply also pushed inflation through increased cost of production of major and stable foods. Government policy regarding productivity enhancement of important crops like wheat, rice, sugarcane and pulses is good initiative towards more food availability but enhancing purchasing power of the consumers through lowering cost of production and enhancing per capita income may incentivize the economic access to food and nutrition. Furthermore, government should launch awareness campaign for balanced and healthy food habits. It is also recommended that government should take measurement to undertake dietary guidelines for consumers and strictly enforce labeling of processed food for ingredients and health hazards.

Figures on equating plot and Differential Item Functioning (DIF):

Figure-2: Equating Plot

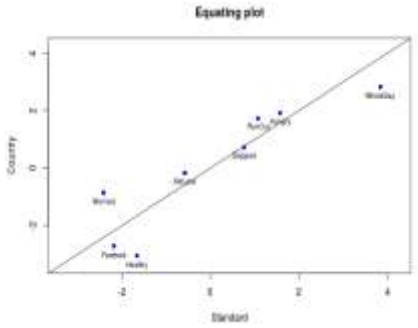


Figure-3: DIF by Region (1=urban, 2 = Rural)

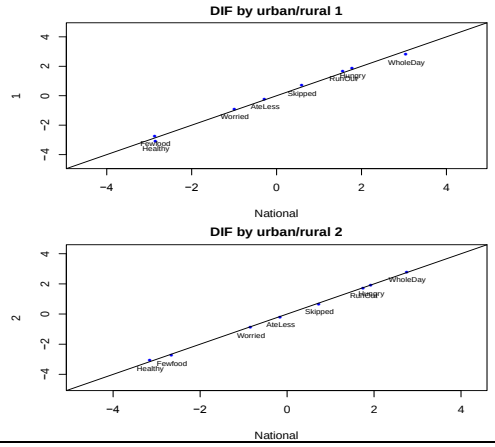
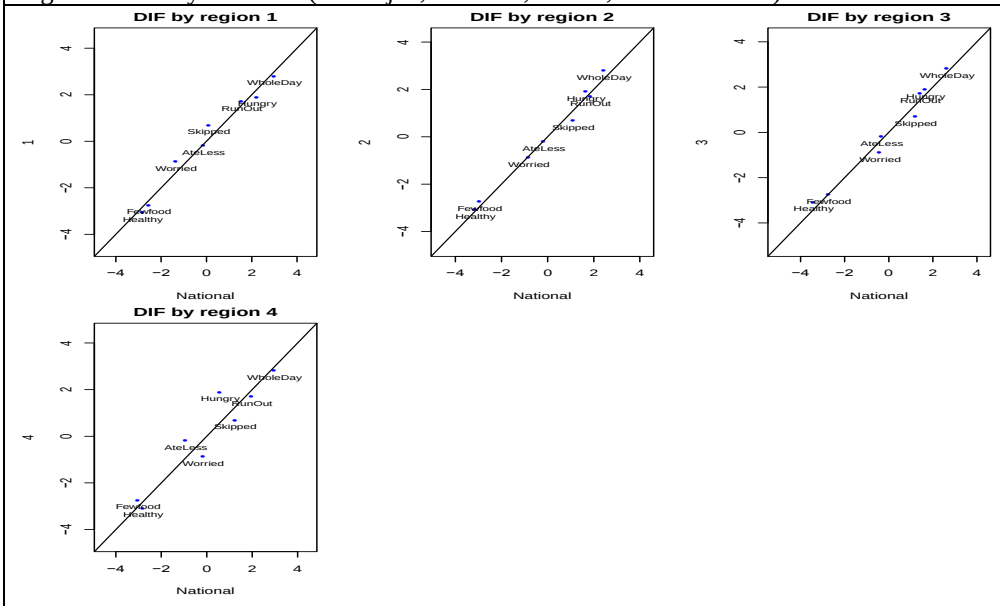


Figure-4: DIF by Province (1=Punjab, 2=Sindh, 3= KP, 4=Balochistan)



References:

Chambers, R. and R. Conway, (1992). Sustainable rural livelihoods: Practical concepts for the 21st century. IDS discussion paper, No. 296. pp.127-130.

Clay, E. (2002). Food Security: Concepts and Measurement, Paper for FAO Expert Consultation on Trade and Food Security: Conceptualising the Linkages Rome, 11-12 July 2002.

Devereux S (2000). Famine in the twentieth century, IDS working paper, 105. Institute of Development Studies, Brighton.

FAO. (1983). World Food Security: a Reappraisal of the Concepts and Approaches. Director General's Report. Rome.

FAO. (1996). World Food Summit. Report of the World Food Summit, 13-17 November, 1996. Food and Agriculture Organization, Rome, Italy. http://www.fao.org/3/w3548e/w3548e00.htm.

FAO. (2016). Country Fact Sheet on Food and Agriculture Policy Trends: Socio-economic context and role of agriculture. Food and Agriculture Organization of the United Nations, Rome, Italy, 2016.

Heidhues, F., A. Atsain, H. Nyangito, M. Padilla, G. Ghersi and J. Le Vallée (2004). Development Strategies and Food and Nutrition Security in Africa: An Assessment. 2020 Discussion Paper No. 38.

Rasch, G. (1961). On general laws and the meaning of measurement in psychology. In J. Neyman (Ed.), Proceedings of the Fourth Symposium on Mathematical Statistics and Probability, Vol. 4. Berkeley: University of California Press, 321–333.

Sen, A. K. (1981). "Ingredients of Famine Analysis: Availability and Entitlements", Quarterly Journal of Economics, Vol. 95.

Shukhatme, P.V. (1961). The World Hunger and Future Needs in Food Supplies. Journal of Royal Statistics Society, 124: 463, 1961.

World Bank. (1986). "The World Bank's Study for Reducing Poverty and Hunger". A report to the development community. EnvironmentallySustainable DevelopmentStudiesand MonographsSeries No. 4. TheWorldBank,Washington, D.C.

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