Calorie Deprivation in the District of Puruliya and Paschim Bardhaman
A Comparative Analysis

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Abstract- **Puruliya and Paschim Bardhaman are two neighbor districts different from each other in terms of living standard, economy, food habits, and source of income. Our objective of study in this paper is to estimate the level of food insecurity measured in terms of calorie deprivation in the selected districts. Since the availability of calorie depends on the pattern of food intake by the households and the two districts under study are different with respect to their socio-economic-climatic conditions, the calorie deprivation in the district of Paschim Barddhaman is likely to be different from that of the district of Puruliya. With this end in view, we have collected data of total 1400 households (650 from Paschim Bardhaman and 750 from Puruliya) and developed an indicator to measure the pattern of consumption of food by using the Principal Component Analysis based on a 4-point Likert scale. The value of the score of the food consumption pattern moves from 0 to 100 implying more and more nutritionally balanced food patterns or less calorie deprivation. The result of estimating the Linear Econometric Model on calorie deprivation shows that Puruliya (Paschim Bardhaman) has the food-insecure households to the extent of 53.47% (41.08%). Our regression analysis shows that an inadequately nutrient-rich food consumption pattern is the important determinant of such a result. Family income, the expenditure made on food, family size, region, holding of land, and livestock – all have a significant impact on food security for both districts. The highest educational attainment by any of the household members has a significant impact on food security in the district of Paschim Bardhaman but the result is insignificant in the case of Puruliya and the reverse happened for the age of the head of the households.**

INTRODUCTION

The definition of food security is actually roaming around to access the nutritionally adequate, safe food throughout the lifespan of individual (Parnell and Smith, 2008 and Cook and Frank, 2008). Dietary diversity gets increased attention as nutrition security is still remains unattained in spite of achieving self sufficiency in food grains (Chand and Junrani 2013, Deaton and Dreze 2009 and Patnaik 2010) though diversified nutritious diet has huge impact on nutrition and health.

Puruliya and Paschim Bardhaman are two neighboring district very different from each other. Puruliya is treated as one of the most backward state in West Bengal with HDI rank 16. District has the population density of 468 inhabitants per square kilometre, literacy rate 65.38% and schedule caste and schedule tribe consists of almost 19.37% and 18.45% in the population respectively (census 2011). On the other hand Paschim Bardhaman (formed on 7th April 2017) is mostly an urban mining-industrial district. According to census 2011 the district has population density of almost 1800 inhabitants per square kilometre and 78.75% literacy rate.

Backwardness impacts the quality of human life. Low per capita income, less income opportunity, seasonal agricultural unemployment all backwardness in human life of Putuliya. Food is one of the most important factor which can bring overall wellness to human body and helps to built a healthy productive human resource which can transform the backwardness into wellness. Paschim Bardhaman is a bit different in terms of food preferences than Puruliya. Though most of the population in the district are from high income group due to industrial-mining income opportunities food habit is tending towards fast food, processed food which may lead food insecurity. These pictures motivate us for our present study where we want to compare between the status of food insecurity (food security) of these two neighbour district.

Food insecurity is not necessary to be a result of not having sufficient food eat. It can be a result of unhealthy pattern of consumption or not fulfilling the requirement of the calories fully prescribed by medical practitioners or dieticians because of improper diet plan. In our study we have defined food insecurity in terms of calorie deprivation. Where calorie deprivation will be the ratio of households required daily calorie on basis of ICMR Report 2020 and the calorie household actually consumed given their daily diet. As pattern of daily diet can vary by household to household, community to community region to region it leads variation in calorie consumption. Therefore in our present paper we want to examine the status of food insecurity in two neighbour district namely Puruliya and Paschim Bardhaman in West Bengal. Both the districts are way different from each other in terms of their livelihood, living standard, economic condition and also in terms of their pattern of consumption of food.

LITERATURE REVIEW

A comparative study on Dhar and Dadia district of Madhya Pradesh (**Vellaichamy et al 2018**) shows that the DDS (Diet Diversity Score) ranging between 3.9 to 4.7 for Dhar and 5.0 to 6.4 for Datia. According to the study females are more undernourished than males and majority of the population does not possess any knowledge of proper nutrition so, addressing the issue of nutritional education, proper nutrition-sensitive agriculture, diversification of diet etc is necessary.

Maitra, Rammohan and Ray(2014) have suggested that there may be a link between declining food intake, unhealthy patterns of consumption and undernourishment, especially for children of age group 0 to 3 during 1998- 2006 and the result shows very poor evidence for weight for height, the z score of children is a bit better but the calorie intake and consumption of cereals have declined over the period.

Parappurathu(et.al 2015) opted to check the food consumption pattern and the diversity in the diet of twelve villages from the eastern region of India. As there are significant disparities in the socioeconomic and demographic profile along with the taste and preferences in food choices that get reflected in the result of multiple regression estimates which shows that the households with higher educated male heads and with better purchasing power and income level seek higher Dietary Diversity scores and the population belongs to SC/ST caste and with lower income levels and seeks lower dietary diversity scores.

The paper of **Chen and Lu(2018)** has tried to look into the matter of food security in terms of priority setting between agricultural corporations in all three countries i.e India, Bangladesh, and Myanmar. After using FSI to measure the level of food security, the study showed the food demand was secure for India and Myanmar during 1990-2013 and there is a shortage of up to 10% in most of the years for Bangladesh before 2008.

Some common health issues suffered by adolescent girls of the 21st century due to eating disorder (ED) and its relation with BMI has been computed (**Saha et al 2022**) through a cross-sectional study on 100 female nursing students. The result shows a positive correlation between ED BMI and body fat percentage.

A study on change in the pattern of consumption (**Banerjee**) that took place during the last 10 years in the Sundarban area of West Bengal shows that the fast-changing consumption pattern creates complicated interactions and generates problems in the local market due to the factors like expanding ad-world exposure, forced migration etc.

A study on the status of food insecurity and its determinants in rural households in Ethiopia, where coffee and wheat are dominant crops (**Muche et.al 2022**) shows 43.2% of households are food insecure and 56.8% are food insecure and logistic economic model provides the result where educational level, land degradation, credit possibility to coffee and wheat growers, access to the market, and agricultural advisory service have a significant impact on food security.

Consumption profile of socially excluded people in terms of caste, religion, economic condition and other have been addressed in a study (**Adhikary et al 2012**) by using the goal post index and testing the Engels law and it is observed that the consumption profile of socially excluded people is all times lower than the other caste or section of people.

A study has been carried out on a primary survey of three districts of West Bengal i.e Burdwan, Hoogly, and Puruliya to examine the status of food security on basis of crop diversification (**Paul et al 2016**). The result has shown that Burdwan has a maximum number of diversified crops, both in the traditional and commercial categories, which undoubtedly leads to food security. On the contrary, in Puruliya crop diversification, agriculture, and food security seem to be very poor. So the concluding point is areas with higher crop diversification towards the non-food commercial crops have achieved higher food access and higher food security subsequently.

Only 20% of households are identified to be food secure,44% are identified to be food insecure and 30% are food insecure with a moderate level of hunger,6% households are identified to be food insecure with severe hunger level in a study on coping strategies for rural households to fight against food in securities in rural West Bengal (**Sankar and Shekhar**). A significant association has been found between MPCE status, education of household head, caste, source of income, and holding livestock with food security by using a binary logistic regression model. Therefore, studies are demanded the attention of policy planners to the study area to address the food safety plans.

Almost 80% of families are food secure and the status of food security increases with the increase in economic status in Sylhet Division (**Perveen et al 2021**). Though, they fall in the negative energy group, despite being food secure. Thus, policy intervention is required to improve their nutritional status.

A cross-sectional study among 240 households in the slums of Bankura (**Mitra et.al 2023**) to assess household food security along with nutritional adequacy, dietary diversity etc. for the age group of children under 5 shows that 29.1%, 44.23%, and 26.6% are the percentages of having food security, low and very low food security respectively.

The massive change in food consumption patterns had taken place after 1990 due to a decline in cereal consumption (**Arun 2020**) but the consumption pattern varies from consumer to consumer, and place to place. That has also been pointed out in this paper.

OBJECTIVE

The prime objective of our paper is to compare the two neighboring districts in terms of their food security status. As both the districts are way different from each other in terms of livelihood, income, consumption, taste and preferences. Therefore our study performs two objectives.

- At first we want to observe, whether the Engel's law valid for both the district or not? This shows the proportion of income of the households' spent on food items.
- Next, we want to test the impact of food consumption pattern and income along with some other common variables on calorie deprivation, so that we can compare the impact of these factors on both districts in terms of food security status.

METHODOLOGY

Our first job is to compute the pattern of consumption for both districts. For this reason, we have used the principle component analysis method on the dataset, collected by using 4 points Likert scale method on common 12 food components. The value of the food consumption pattern lies from 0 to 100. A value close to zero means an unhealthy pattern of consumption and a value close to 100 means a healthy pattern of consumption.

Our next job is to compare between incomes spent on food for both districts. For this reason, we have used Engel's law using the formula

$$FDEXP = \alpha_0 + \beta_0 (FMINC) + u_0$$

for both districts separately. And then Finally, we have used an equation for our linear estimation where calorie deprivation (**CALDEP**) is a function of food consumption pattern (**FDCNPT**), family income (**FMINC**), food expenditure (**FDEXP**), families highest qualification (**HSEDN**), age of household head (**AGHD**), family size (**NMEM**), number of ration card holding (**NMCRD**), area of living (**RGION**), religion (**RLGION**), caste (**CST**), gender head of the family (**GNDRHD**), job assurance card (**JOBCRD**), agricultural land holding (**LAND**), live stock holding (**LVSTK**), having land and live stock (**LNDLVSK**) both along with district (**DIST**) as a categorical variable and a random disturbance term. So our equation for estimation is

$$CALDEP_i = \beta_0 + \beta_1 FDCNPT_i + \beta_2 FMINC_i + \beta_3 FDEXP_i + \beta_4 HSEDN_i + \beta_5 AGHD_i + \beta_6 NMEM_i + \beta_7 NMCRD_i$$
$$+ \delta_0 DIST_i + \delta_1 RGION_i + \delta_2 RLGION_i + \delta_3 CST_i + \delta_4 GNDRHD_i + \delta_5 JOBCRD_i + \delta_6 LAND_i + \delta_7 LVSTK_i + \delta_8 LNDLVSK_i + u_i$$

Hypothesis will be-

Hypothesis_1: FDCNPT affects the CALDEP negatively ($\beta_1 < 0$).

Hypothesis_2: CALDEP is inversely linked with FMINC ($\beta_2 < 0$).

Hypothesis_3: FDEXP may affect CALDEP negatively.

Hypothesis_4: HSEDN is expected to decrease CALDEP ($\beta_4 < 0$).

Hypothesis_5: AGHD is expected to affect the CALDEP positively ($\beta_5 > 0$).

Hypothesis_6: CALDEP is expected to increase with size of the family i.e.; NMEM ($\beta_6 > 0$).

Hypothesis_7: Holding PDS card and availing the benefit from it is likely to reduce the calorie deprivation i.e.; ($\beta_7 < 0$).

Hypothesis_8: Calorie deprivation in rural areas is expected to have higher incidence than in urban areas.

Hypothesis_9: Hindu community is expected to have higher food security in our study area.

Hypothesis_10: General caste households are expected to have better calorie availability than Non-general caste.

Hypothesis_11: The female headed households likely to have less calorie access than male headed household.

Hypothesis_12: Having job assurance card may ensure calorie security.

Hypothesis_13: Owning agricultural land expected to ensure food security.

Hypothesis_14: Livestock holding helps to improve calorie consumption.

Hypothesis_15: Those who own both land and livestock definitely expected to have better calorie consumption than others.

Hypothesis_16: As Paschim Bardhaman has a better economic condition than Puruliya therefore Paschim Bardhaman is expected to have food security condition better than Puruliya.

DATA DESCRIPTION

To serve our objective we have opt for a cross sectional study. Total of 1400 data from households of the district Paschim Bardhamn (650) and Puruliya (750) has been collected. A pre tested questionnaire was made previously and we have selected the rural and urban blocks using purposive sampling. The data of food consumption patter was collected by using ht 4 point Likert scale method after selecting some common food component of different nutrient group available in as well as preferred by the households of both the district.

ESTIMATION AND DISCUSSION

In this section we are going to present our descriptive summery statistic and comparative analysis on our estimation result on calorie deprivation of both the district. Table 1 represents the comparative nature of some important quantitative variables for both of our study district. Mean income for of our sample household in Paschim Bardhaman is Rs.33861 and in Puruliya is Rs.11111. Maximum earned monthly income by any household in Paschim Bardhaman is Rs. 150000 where as in Puruliya that income is Rs. 25000. In case of minimum monthly income earned by any household we get the value of Rs. 25000 for Paschim Burdhaman and Rs. 2500 for Puruliya.

Educational qualification in our data set of Puruliya varies between no years of education to highest 17 years of education on the other hand in the data set of Paschim Bardhaman that varies between '0' years of education to highest 19 years of education.

Life expectancy in Paschim Bardhaman is no doubt greater than life expectancy in Puruliya and that is visible from our data of age of the household head. Mean age for Paschim Bardhaman is 60.2 years with maximum and minimum age of 80 years and 40 years respectively whereas mean age for Puruliya is 57.2 years with maximum and minimum 78 years and 20 years.

Table-1 Status of socio-economic-demographic profile of Paschim Burdwan (P. Bdn) and Puruliya

	Family Income		Highest Family Education		Age of Family Head		Family Size		No of Ration Card	
	P. Bdn	Puruliya	P. Bdn	Puruliya	P. Bdn	Puruliya	P. Bdn	Puruliya	P. Bdn	Puruliya
Mean	33861	11111	10.3	6.9	60.2	57.2	4	4	3	4
Median	30000	11300	12	6	62	54	5	4	4	4
Max	150000	25000	19	17	80	78	7	6	7	6
Min	5000	2500	0	0	40	20	1	2	0	1

*Author's own computation based on primary data

Our data set of both the districts are very similar to each other in terms of Family size with mean 4 for both the district. Paschim bardhaman has single member household as well as maximum of 7 member household in sample and data of Puruliya district contains 6 member household and 2 member household as maximum and minimum figure of family size.

Mean value of ration card holder household is 3 for Paschim Bardhaman and 4 for Puruliya. Paschim bardhaman has some of household where all seven member has ration card similarly Puruliya has households where all 6 members holds card and in reverse some households does not has any ration card in Paschim Bardhaman.

Table 2 contains the percentage value of status of some important qualitative variable for both the district. Our data has 47.69% rural and 52.31% urban household in Paschim Bardhaman and 33.3% rural household and 66.7% urban population in Puruliya. Distribution of Hindu and Non-Hindu household are 83.08% and 16.92% respectively for Paschim Bardhaman and 36.13% and 63.87% for Puruliya respectively. Puruliya and Paschim Bardhaman has households from General caste 50.40% and 50.62% respectively and Non-General caste of 49.60% and 49.38% respectively. Paschim Bardhaman has 74.92% male headed household and 25.08% female headed household. Puruliya consists of 65.33% male headed and 34.67% female headed household.

Table-2 Status of Important Qualitative Factors and Food Security Condition of Paschim Burdwan (P. Bdn) and Puruliya

		P.Bdn	Puruliya
Region	Rural	47.69%	33.3%
	Urban	52.31%	66.7%
Religion	Hindu	83.08%	36.13%
	Non-Hindu	16.92%	63.87%
Caste	General	50.62%	50.40%
	Non-General	49.38%	49.60%
Gender Head	Male Headed	74.92%	65.33%
	Female Headed	25.08%	34.67%
Food Security Status	Food Secure	58.92%	46.53%
	Food Insecure	41.08%	53.47%

*Author's own computation based on primary data

Food security is a qualitative variable here which we have created with the ratio of daily available calorie to required calorie. We have 58.92% and 46.53% food secure household in whereas 41.08% and 53.7% food insecure household in Paschim Bardhaman and Puruliya respectively.

Table 3 represents the income spent on food for both the districts. Result of Engel's law shows. As Engel's curve says proportion of expenditure on food items or necessary item reduces due to rise in income our regression result for both the district validate the Engel's law. For both the district i.e; Paschim Bardhaman (-3.2E-06) and Puruliya (-7.7E-06) we have negative coefficient and both the coefficients are statistically significant at one percent level of significance. Result implies that for both the district whether its economic condition good or bad if income of the household increased proportion of income spend on food item decreases.

Table-3 Expenditure on Food: Test Engel's Law

Paschim Barddhaman							
	Coeff.	Std. Error	t Stat	P-value	R Square	Adjusted R Square	Number of Observations

					R Square	Adjusted R Square	Number of Observations
Intercept	0.376	0.011	32.731	0.000	0.166	0.165	650
FMINC	-3.2E-06	2.83E-07	-11.359	0.000			

Puruliya

	Coeff.	Std. Error	t Stat	P-value	R Square	Adjusted R Square	Number of Observations
Intercept	0.177	0.005	38.287	0.000	0.347	0.346	750
FMINC	-7.7E-06	3.84E-07	-19.933	0.000			

*Author's own computation based on primary data

Table 4 shows our result of regression analysis on calorie deprivation (food insecurity) for both of our study area. Our first parameter is district here where Paschim Bardhaman holds dummy value 1 and Puruliya holds dummy value 0. Estimated parameter (-0.23) shows Puruliya is more calorie deprived than Paschim Bardhaman and the result is significant at 1% level of significance.

Food consumption pattern is a continuous variable here which is negatively (-0.025) related to calorie deprivation. The result is significant at 1% level.

As income of the household increases calorie deprivation is likely to be reduced. The coefficient (-0.014) is significant at 1% level.

If expenditure on food increases calorie deprivation decreases. Coefficient (-0.00002) is significant at 1% level. Though expenditure on food may increase due to price hike of food components or excessive purchase of high priced fast food or processed food, in that case calorie deprivation may not reduce or even can go worse off.

In our present study highest qualification of the household shows insignificant result.

Age of the head of the household here shows inverse relation (-0.002) with calorie deprivation at 5% level of significance. It is possible because age enriched people with experience and that experience can provide the knowledge of what to eat and what not to eat.

Calorie deprivation is positively (0.23) linked with family size and it is significant at 1% level.

As household avails more PDS benefits with more number of cards calorie deprivation decreases. The result (-0.03) is significant at 1% level.

Table-4: Regression Result on Calorie Deprivation (Food Insecurity) in the District of Puruliya and Paschim Barddhaman.

Source	SS	df	MS	Number of obs	=	1400
				F(16, 1383)	=	38.8000
Model	104.4949	16	6.53093	Prob > F	=	0.0000
Residual	232.7836	1383	0.16832	R-squared	=	0.3098
				Adj R-squared	=	0.3018
Total	337.2785	1399	0.24109	Root MSE	=	0.4103
CALDEP	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DIST	-0.23483	0.04957	-4.7371	0.0000	-0.25103	0.44552
FDCNPT	-0.02537	0.00595	-4.2631	0.0001	-0.09137	0.14211
FMINC	-0.01370	0.00491	-2.7908	0.0013	-0.04160	0.08315
FDEXP	-0.00002	0.00001	-3.9300	0.0000	-0.00003	-0.00001
HSEDN	-0.00059	0.00302	-0.1968	0.8440	-0.00652	0.00533
AGHD	-0.00243	0.00104	-2.3330	0.0200	-0.00039	0.00448
NMEM	0.23367	0.01241	18.8349	0.0000	-0.05801	0.50933
NMCRD	-0.02641	0.00979	-2.6982	0.0070	-0.00721	0.04561
RGION	0.01159	0.03389	0.3419	0.7320	-0.05489	0.07806
RLGION	-0.00536	0.02895	-0.1850	0.8530	-0.06215	0.05143
CST	0.01066	0.02773	0.3843	0.7010	-0.04374	0.06505
GNDRHD	0.01448	0.02995	0.4834	0.6290	-0.04428	0.07323
JOBCRD	-0.05114	0.02317	-2.2072	0.0163	-0.09566	0.03431

LAND	-0.06896	0.03174	-2.1729	0.0257	-0.08016	0.04436
LVESTK	-0.04237	0.02130	-1.9890	0.0243	-0.08538	0.08272
LNDLVSK	-0.05526	0.02499	-2.2114	0.0127	-0.07426	0.15311
_cons	1.73243	0.08491	20.4033	0.0000	1.56587	1.89900

*Author's own computation based on primary data

The parameters region, religion, caste and gender of the household head are insignificant in our present study.

Having a social security assistance like job card (-0.05) helps to improve calorie intake. The result is significant at 5% level.

As owning agricultural land (-0.07), holding livestock (-0.04) and holding both land and live stock (-0.06) promotes income therefore expected to provide better calorie consumption. All three parameters are significant at 5% level of significance.

CONCLUSION AND POLICY PRESCRIPTION

Consuming right food in right proportion is important to maintain a healthy life. In most of the cases as people don't know what to eat and what not to eat to maintain a healthy balanced diet for a healthy productive body therefore if they have access to purchase, they purchased junk, high calorie processed or packaged food or cereal based high calorie that even affected health in adverse way. Two districts of our study has very different socio economic demographic feature. One is very advanced in terms of economy livelihood and diversity in food and the other is one of the most backward districts in West Bengal.

Study reflects that Paschim Barshaman has better food access which leads balance food pattern therefore less proportion of calorie deprivation. Therefore, it is required for Puruliya to have more access to diverse food items in the food market and generate the awareness regarding diverse food consumption.

As data of Paschim Bardhaman consists of large portion of high-income group therefore they can access the diverse food groups which is lacking for Puruliya therefore policies regrding income generation should improve for Puruliya but on the contrary high income in Paschim Bardhaman leads high expenditure on processed foods that creates health issues therefore awareness programme should be initiated regarding healthy balanced nutritious diet.

Having social security assistance can promote better calorie consumption therefore improvement or further consideration on those policies can improve the condition further as in PDS food grains are very much cereal based, if diversified food groups can be provided through subsidised food grain supply scheme then it may improve calorie consumption in better way. Land, livestock and having both land and livestock helps better calorie consumption so government should bring some policies to encourage people for owning livestock and revise the land distribution policies.

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