

## **Existence and Determinants of Female Child Disadvantage: Evidence Based on Anthropometric Measures from Household Survey Data**

**Soma Mandal**

Assistant Professor, Department of Economics, Jadavpur University

**Arpita Ghose**

Professor, Department of Economics, Jadavpur University

### **Abstract**

*Given the fact that female-male ratio is less than unity as reported by various all India Census figure for various census year, this paper finds out the evidence of the existence of discrimination against female child, termed here as female child disadvantage (FCD), using an anthropometric measure of malnutrition–stunting (having less height than usual for age) following World Health Organization (WHO) criterion for malnutrition and exploring household level data collected from primary survey from some unplanned settlement of West Bengal, India. The use of such anthropometric measure of malnutrition in estimating FCD is not enough in the literature. The respondents are the mothers having at least one female and one male child of her own (whom she gave birth) within the age interval 6 months and 6 years; sample size being relatively small—219—given the nature of the sample. The analysis using the anthropometric measure reveals the existence of FCD for more than 60% of households. At second stage logit regression is resorted to find out the effect of parental education on FCD along with some other socio-economic variables like working status of the mother, religion, caste, income of the family and the existence of custom of dowry. The education level of both mother and father are found to have significant favorable effect and the existence of custom of dowry is found to have significant negative effect in reducing FCD; thus the enhancement of the opportunity to make the household more educated and pursuing stringent steps against dowry system will be helpful in alleviating FCD.*

**Key words:** Bias against Female child; Female child disadvantage; Parental Education; Anthropometric Measure of Malnutrition

### **1. Introduction**

India possesses a masculine sex-ratio for a very long time as observed from various Census of India publications. The case is same for almost all the states of India. If anyone analyze the juvenile sex-ratio the picture seem more dangerous. It is more skewed and also found to be declining till the last census enumeration. The low and declining juvenile sex-ratio will likely to make the overall sex-ratio much skewed in the future census enumeration as compared to the present status.

According to the researchers, this masculine sex-ratio is caused from the strong son preference and the associated discriminatory treatment against females (Kisore, 1993; Pal, 1999). Females are subject to fatal discrimination from the very beginning of their life. In many cases unwanted female fetus are aborted by their parents and family members before they born. Those who cannot afford to use this device for legal or some other causes, may try to kill their female children using some deliberate measure or by severe negligence. The girl child may be deprived of sufficient food and nutrition and may even be deprived of regular and curative care (Asfaw, Lamanna, and Klasen, 2010; Pitt, Rosenzweig and Hassan, 1990).

The discrimination against female child, henceforth termed as female child disadvantage (FCD) can be observed using various viewpoints – from the point of view of expenditure on education, educational outcomes, expenditure on food and nutrition, regular and curative medical care, healthcare outcome, workforce participation rate, mortality rate, fertility rate etc.

The present paper considers the health care perspective. Based on primary survey data the paper considers FCD as the manifestation of the discrimination (lack of care and upbringing etc.) against the female child belonging to the sample on the extent of malnutrition of the said child. As the existence of malnutrition is likely to be manifested in the growth of any child (height), the height for the children in the sample are considered for computing the existence of FCD. Specifically the paper adopts the anthropometric approach for measuring such disadvantage.

The novelty of the present paper and the contribution to the literature is that the existence of female child disadvantage (FCD) is examined, using anthropometric measure –stunting (having less height than usual for age) following World Health Organisation (WHO) criterion for malnutrition<sup>1</sup>, at the household level using primary survey data collected from some selected area of West Bengal, India. Further, to capture the aspects of FCD, it is necessary to select those mothers who have at least two children of opposite sex between the ages 6 months and 6 years of her own. All those mothers fulfilling the said criteria are selected as the respondents. For each respondent all her children between the stipulated ages are investigated separately for their height, weight and age.

The paper in fact supports the existence of FCD for more than 60% of the household.

---

<sup>1</sup>Stunting means having less height than usual for age which is measured by the deviation of height for the said child from the median height of the children of the same age and sex group, deflated by the standard deviation of the height of the children of the same age and sex group.

After finding out the evidence of the existence of FCD, at second stage a logit regression is resorted to explain for the existence of such disadvantage and hence the different means of reducing it. Since such FCD is supposed to be generated from wrong perception, enhancing proper knowledge by spreading the light of education may be one weapon to reduce such menace. The literature also supports the positive role of female education on FCD (Klasen and Wink, 2002). Klasen and Wink (2002) has considered the data at community level and the role of male and female education in general, but did not considered either of mothers' or fathers' education separately. The role of parents' education—both of mothers' and fathers'—is very important towards reduction of FCD. Pal (1999) has used household level data and considered the effect only of mothers' education, and not of fathers', on the malnutrition of boys and the girls separately in the household and inferred about the effect of mothers' education on discrimination against female child by comparing the two regression results without estimating the existence of the disadvantage. However, Pal (1999) did not found any effect of mothers' education on the said disadvantage. In the literature Mukherjee, Dutta and Banerjee (2010) proposed a simple measure of gender bias through quantifying differential stopping behavior, a particular method of obtaining a higher proportion of sons by parents by using only observed data on the distribution of children in a household, the age and sex of the offspring. The measure was illustrated using the household level data of NSSO from some selected districts of Assam and they found head of the household's education (M) and the share of the head of household education in total education level of both head of household (M) and his wife (F) ; i.e.,  $M/(M+F)$  has significant effect in explaining gender bias. Increase in the education level of the head of the household reduces the gender bias. Also the increase in the education level of the wife of the household head is significant in explaining  $M/(M+F)$ .

The present paper estimates the effect of the education of both the parents on the existence of FCD after controlling for the other possible socio-economic factors. Among the socio-economic factors, income is included to test whether there is any association between income and FCD. It may be possible that FCD may be more prominent among the lower income group. To examine the effect of outside exposure of the mothers and also their economic independence on FCD, the working status of the mother is incorporated. It may be possible that FCD vary across different social groups/community or across religions. To take account of this fact caste and religion dummy variables are incorporated. The other factor included is the custom of dowry. It may be possible that its existence may influence FCD through making females as liability and males as asset to any family.

As expected, in the results of estimation the fathers' education turns out to be a favorable factor in reducing FCD along with mothers' education. Among the

socio economic variable the existence of dowry negatively and significantly affects FCD.

The paper is formatted as follows: Section 2 presents the data and methodology. The results of analysis are presented in section 3 and section 4 concludes.

## **2. Data and Methodology**

### **2.1 The Data:**

The data used for the analysis of the present study is collected from a household level primary survey conducted over some unplanned settlements in West Bengal, India. The study area is some village around Kalyani township in Chakdaha block of district Nadia. This area is under the jurisdiction of Gram Kanchrapara gram-panchayet. The male members of the family are working mostly in the informal sector (working in daily basis). People reside mainly in bamboo made kachcha houses. The source of drinking water is hand pump.

The problem as narrated requires that the sample should comprise of those households only in which the mother have at least one female and one male child of her own (whom she gave birth) within the age interval 6 months to 6 years. Thus, our sample has to be purposive in nature. We interviewed all those mother who satisfy these criterion. In this analysis, household means a husband, a wife and their children and the other members eating from the same kitchen are included in the family along with them. Hence two or more respondent and their household may be interviewed from the same family, provided there is a matching of the stipulated criterion. The sample size is not very large as the criterion for selection of respondent is restrictive.

In the questionnaire the first part contains the information about respondent and her family (age, education, occupation of the respondent and her husband; the religion, caste, income of the family and the like) and the second part contains the information about the children of the specified age group like their age in months, height in cms and weight in kgs etc. The second part is collected for each of the child of stipulated age within the household separately as this information is needed to construct the indicators capturing the extent of malnutrition of a child.

### **2.2 Measurement of Disadvantage:**

Among the common measures available in the literature of malnutrition stunting (less height than usual for age) is used in the paper. In the literature it is taken to be a manifestation of long run phenomena and is termed as chronic malnutrition (Bisika and Mandere, 2008).

To capture the extent of malnutrition, nutritional deficiency is calculated using “WHO child growth standards” and “WHO reference 2007” tables for (i) children age up to 5 years and (ii) the children more than 5 years age and up to 6 years respectively. According to WHO criterion, the measure of deficiency in

nutritional attainment-- Z-score for any child is estimated as the ratio of the deviation of the actual height of the said child from the median height of the children in the same age and sex group (reference group) to the standard deviation of the heights of the reference group. Thus, one obtain

$$Z - score = \frac{HA - MeH}{SDH}$$

Where,

**HA** is the height for the child in consideration

**MeH** is the median height of children of same age and sex (reference group--obtained from the WHO tables)

**SDH** is the standard deviation for the height of children of same age and sex (reference group--obtained from the WHO tables)

Following steps are used to measure the female child disadvantage:

Step 1 For all surveyed children at the stipulated age group, Z-scores are calculated using above relation.

Step 2: For those households having more than one boy and (or) girl within the stipulated age, average value of the Z-scores are computed both for girl and the boy children separately within the family in the stipulated age group, thus one get two and only two average Z-score for each family – one for boys and the other for girls.

Step 3: The average Z-score for girls is then subtracted from the average Z-score for boys for every household.

If for a household malnutrition for girls is more than the boys, the value of Z-score (measuring the deficiency in nutrition) for boys will be less negative than that for girls. So the difference between the Z-score for boys ( $Z_mH$ ) and the Z-score for girls ( $Z_fH$ ) will turn out to be positive for this household. A new variable VAH (Value of difference between Z-score for boys and Z-score for girls according to height for age measure) is estimated as

$$VAH = Z_mH - Z_fH$$

FCD is said to exist if VAH turns out to be positive.

More compactly, the existence of FCD can be tested by constructing the binary variable FCDH (Female child disadvantage according to height for age measure showing the presence of female child disadvantage as defined by the relation (1) below.

$$FCDH = 1, \text{ if for any household } VAH > 0 \quad \dots\dots\dots (1) \\ = 0, \text{ otherwise}$$

Where,  $VAH = Z_mH - Z_fH$

$Z_mH$  = Average height Z-score (stunting) for male children

$ZfH$ = Average height Z-score (stunting) for female children

### 2.3 The determinants of female child disadvantage:

The variable  $FCDH$  is supposed to be affected by the following set of explanatory variable.

(i) **Educational attainment of the respondent, the mother ( $ER$ ):** It is expected that as the education level of the mother increases they will be more free from wrong social values and bias against female child and hence the extent of care towards the female child increases which in turn increases the level of nutrition of the female child as compared to the male child. It is already been stated that a positive relation between level of education and discrimination against female child is found in the work of Klasen and Wink (2002). In the present context  $ER$  is an ordered variable ranging from 1 to 7; higher educational value implies higher  $ER$  value. It is defined as

$ER = 1$ , if the mother is completely illiterate;  
 $=2$ , if the mother is able to read and write to some extent but has not availed any schooling facility;  
 $=3$ , if the mother obtained primary education;  
 $=4$ , if the mother attained class 5 to 8;  
 $=5$ , if the mother attained class 9 to 10;  
 $=6$ , if the mother attained class 11 to 12;  
 $=7$ , otherwise.

(ii) **Educational attainment of the father ( $EH$ ):** Here also it is assumed that the higher the educational level of the father the lower the extent of bias towards female child in the family. As in our earlier case  $EH$  is an ordered variable ranging from 1 to 7. It is defined similarly as  $ER$  for mothers' education.

(iii) **Working status of the respondent, the mother ( $W$ ):** It is likely that working mothers are freer from the bias than the non-working mothers, as the former have more outside exposure. To test this proposition  $W$  is included as an explanatory variable. Notably it may be mentioned that the role of female worker in explaining the discrimination against the female child can be found in the work of Murthi, Guio and Dreze (1995). It is a binary variable defined as

$W = 1$ , if the mother is working;  
 $=0$ , otherwise.

(iv) **Religion of the family of the respondent ( $RE$ ):** This variable is taken to test whether the household coming from different religion acts differently towards

their female population. Only two religions are found in the sample. It is a categorical variable defined as

$RE = 1$ , if the household is Hindu;  
 $= 2$ , if the household is Muslim.

In this context it may be mentioned that the literature supports the role of religion of the family in explaining FCD (Mukherjee et al., 2010; Pal, 1999)

(v) **The existence of the custom of dowry (*DO*):** It is expected that as the existence of the custom of dowry makes the females liability towards their family, it can enhance the bias against them. The role of dowry system to explain the bias against females can be found in Lahiri and Self (2007). It is a binary variable defined as

$DO = 1$ , if there exist the custom of dowry in the household;  
 $= 0$ , otherwise.

(vi) **Social group of the respondent:** In the present sample there are four social groups: Scheduled Caste, Scheduled Tribe, Other Backward Community, and those who do not belong to any category mentioned above. To test whether FCD vary across social groups, and to avoid the problem of dummy variable trap, three dummy variables *CASC*, *CAST*, *CAOBC* are included, indicating the social groups in which the family of the respondents belongs to. The effect of social group is taken into account in the work of Murthi, Guio and Dreze (1995). The dummy variables for social group are defined below:

$CASC = 1$ , if the respondent belongs to Scheduled Caste household;  
 $= 0$ , otherwise.

$CAST = 1$ , if the respondent belongs to Scheduled Tribe household;  
 $= 0$ , otherwise.

$CAOBC = 1$ , if the respondent belongs to Other Backward Community household;  
 $= 0$ , otherwise.

(vii) **Income of the Family (*I*):** It is expected that the higher the income of the family, people will be more concerned about the social values and hence will put less discriminatory measures against the female child. So, family income can be considered as a factor in explaining FCD. It is a continuous variable measured at 1000 rupees unit. Mukherjee et al. (2010) used income as the determinant of son preference.

#### 2.4 The model used to explain the existence of female child disadvantage:

The dependent variable in the model (*FCDH*) is binary in nature, like qualitative variables and can take either 1 or zero value. Hence the model can be estimated by using logit regression analysis where the probabilities describing the possible outcomes of a single trial are modeled, using a logistic function, as a function of the explanatory (predictor) variables. Logistic regression measures the relationship between the binary dependent variable and the independent variables, by using probability scores as the predicted values of the dependent variable. In Logit analysis the binary variable can be converted into a continuous variable  $Y = \log(P/1-P)$ , defined as the log odds ratio, which ranges from  $-\infty$  to  $+\infty$ ,  $P$  being the probability that any observation belongs to the group having 1 as the value of the dependent variable. The log odds ratio will be a function of the included explanatory variables. The models are estimated by maximum likelihood method of estimation. To get the effect of the  $i$ th explanatory variable, one needs to calculate the marginal effect, which is defined as  $a_i P (1-P)$  and represents the effect of a change in explanatory variable on  $P$ , where  $a_i$  denotes the coefficient of the  $i$ th explanatory variable in the regression explaining the outcome value of the binary dependent variable. (For details about the logit model see Maddala (2001).

### 3. Result

#### 3.1 The descriptive statistics and the percentage of household having the gender bias:

In the Table 1 the results of the descriptive statistics of the present sample as well as the measured percentage of household having bias against the female child are summarized.

**Table 1: Descriptive statistics and the percentage of household having the bias**

Variables	Values of the variables	Percentage of respondent belonging to the said category	Percentage of respondent belonging to the said category show bias against female child
Working status of the mothers ( <i>W</i> )	Working (=1)	8.22%	55.56%
	Non-Working (=0)	91.78%	63.18%
Educational attainment of the mothers ( <i>ER</i> )	Illiterate (=1)	24.20%	84.91%
	Can only read and write (=2)	10.05%	77.27%

	Attains primary school (=3)	17.35%	76.32%
	Studied in class V to class VIII (=4)	28.77%	60.32%
	Studied in class IX to class X (=5)	9.13%	25%
	Studied in class XI to class XII (=6)	5.94%	15.38%
	Studied in college (=7)	4.57%	10%
Educational attainment of the father ( <i>EH</i> )	Illiterate (=1)	16.44%	80.56%
	Can only read and write (=2)	8.68%	89.47%
	Attains primary school (=3)	18.72%	73.17%
	Studied in class V to class VIII (=4)	34.25%	60%
	Studied in class IX to class X (=5)	11.87%	42.31%
	Studied in class XI to class XII (=6)	4.11%	33.33%
	Studied in college (=7)	5.94%	15.38%
Religion ( <i>RE</i> )	Hindu (=1)	90.87%	60.80%
	Muslim (=2)	9.13%	80%
Existence of the custom of dowry ( <i>DO</i> )	Custom of dowry exists (=1)	59.82%	82.44%
	Custom of dowry does not exist (=0)	40.18%	32.95%
Whether belongs to the Scheduled Caste Community or not	Belongs to the Scheduled Caste Community (=1)	34.25%	54.67%
	Does not belong to the Scheduled Caste Community (=0)	65.75%	66.67%
Whether belongs to the Scheduled Tribe Community or not	Belongs to the Scheduled Tribe Community (=1)	8.22%	44.44%
	Does not belong to the Scheduled Tribe Community (=0)	91.78%	64.18%
Whether belongs to the Other Backward	Belongs to the Other Backward Community (=1)	6.39%	78.57%

Community or not	Does not belong to the Other Backward Community (=0)	93.61%	61.46%
Whether belongs to any reserve category or not	Does not belong to the any reserve category (=0)	51.14%	68.75%
	Belongs to any reserve category (=1)	48.86%	56.07%

The estimated results suggests that the indicator—as represented by the equation (1) -- used to capture the existence of FCD support more than 60% of households to be biased against female child [62.56%]. This figure represents the percentage of those households for whom the estimated value of VAH turns out to be greater than zero.

Thus the present sample corroborate the general findings of Sen (1989, 1990), Klasen (1994), Coale (1991), Dasgupta (1987) and others-- supporting the existence of female child disadvantage.

A glimpse at the descriptive statistics shows that, working mothers show less bias than the housewives. In case of educational attainment, parents with high education level show low bias. Hindus are found to be less biased than Muslims which justifies the inclusion of religion as an explanatory variable. The households those confirm the existence of dowry in their respective families are more biased. Also different community showing different percentage of bias justifies the inclusion of communities as dummy variables. Therefore it will be interesting to see the impact of the joint influence of these variables on FCD and taking into account the effect of the other suggested variable income.

### 3.2 Results on the determinants of FCDH:

The results are summarized in the Table 2. The initial estimated logit regression suggests that there exists positive and significant correlation between the variables *EH* and *ER*. Hence two separate sets of regressions are carried out (i) omitting *EH* and taking all other explanatory variables and (ii) omitting *ER* and taking all other explanatory variables. Further, not all the explanatory variables are significant Therefore we have carried out a fresh regression including only the significant explanatory variables in both the cases. Hence, we get two separate sets of regression results. The results of these regressions are summarized in Model 1 and Model 2 respectively and are presented in Table 2. In Model 1 the education level of the respondent (mother) is included while Model 2 includes father's education.

Table 2 provides the estimated value of the coefficient of the explanatory variables, their marginal effects (given in the first parenthesis), z-statistics and the McFadden R-square.

**Table 2: Results of Logit Regression showing the significant explanatory variables**

		According to height measure (stunting)	
		Model 1	Model 2
		Coefficient (Marginal Effect) [z-Statistic]	Coefficient (Marginal Effect) [z-Statistic]
Explanatory variables	<i>Constant</i>	1.391498 (0.167536) [2.909736]	1.035056 (0.13197) [1.994062]
	Educational attainment of the mothers ( <i>ER</i> )	-0.592441 (-0.07133) [-5.190322] ***	-----
	Educational attainment of the father ( <i>EH</i> )	-----	-0.449709 (-0.05734) [-3.787450] ***
	Existence of the custom of dowry ( <i>DO</i> )	2.091252 (0.251787) [5.939027] ***	2.070982 (0.26405) [6.181786] ***
	<i>McFadden R-squared</i>	0.304860	0.253061

**Notes:**

- \* implies significant at 0.05 level
- \*\* implies significant at 0.01 level
- \*\*\* implies significant at 0.001 level

From the estimated result, it can be found that, the significant variables influencing the existence of FCD are the education level of the parents -- both mother and father-- and the existence of the dowry system. Hence, it can be said that, as expected, education of both the parents have a favorable effect in reducing the FCD. Also the existence of dowry poses an unfavourable effect on female child disadvantage for all four models.

#### 4. Conclusion

The present paper contributes to the literature by estimating the existence of female child disadvantage (FCD) using an anthropometric measure –the average stunting level following WHO criteria, taking into account household level data collected directly from the primary field survey from some unplanned settlement in and around a planned township (Kalyani) in West Bengal, India. There is a dearth in the literature concerning the estimation of FCD using such anthropometric measure in the literature. The measure supports the existence of FCD at a level more than 60%. Further, the role of fathers' education is highlighted along with the mothers' education in explaining FCD. Dowry system is the other variable which is found to have significant effect on the occurrence of female child disadvantage.

Thus enhancement of the opportunity to education—both for males and females in their regular age and also in old age—is necessary for reducing the curse like female child disadvantage. Thus establishment of more schools may be helpful in this regard. On the other hand, laws against dowry system should be made more stringent, specifically in its operation and it is also necessary to make the people more aware of the bad effects of the system using various media.

#### References

- Asfaw, A., F.Lamanna and S. Klasen, (2010), Gender Gap in Parents' Financing Strategy for Hospitalization of their Children: evidence from India, *Health Economics*, 19(3), pp. 265-79.
- Bisika, T. and G. Mandere, (2008), Integration of Nutrition in the Antiretroviral Therapy Scale Up Plan for Malawi, *Malawi Medical Journal*, 20(3), pp. 93-98.
- Coale. A. J. (1991), Excess Female Mortality & the Balance of Sexes in the Population: An Estimate of the Number of 'Missing Females', *Population and Development Review*, 17, pp. 517-523.
- Dasgupta, M. (1987), Selective Discrimination Against Female Children in Rural Punjab, India, *Population and Development Review*, 13, pp. 77-100.
- Kishor, S. (1993), May God Give Sons to All: Gender and Child Mortality in India, *American Sociological Review*, 58, pp. 247-265.
- Klasen, S. (1994), Missing Women Reconsidered, *World Development*, 22, pp. 1061-1071.
- Klasen, S. and C. Wink, (2002), A Turning Point in Gender Bias in Mortality? An Update on the Number of Missing Women, *Population and development Review*, 28(2), pp. 285-312.

- Lahiri, S. and S. Self (2007), Gender Bias in Education: the Role of Inter-household Externality, Dowry and other social Institutions, *Review of Development Economics*, 11(4), pp. 591-606
- Maddala, G. S. (2001), *Introduction to Econometrics* (Third Edition), John Wiley & Sons Ltd.
- Mukherjee, D., A. Dutta and D. Banerjee (2010), A New Measure of Gender Bias and its Concomitants, In A. Dhar (Ed.), *Some Contemporary Issues on Development and Growth Economics*, pp. 585-629, Kolkata: Allied Publishers Pvt. Ltd. in collaboration with Jadavpur University, Kolkata.
- Murthi, M., A. C. Guio and J. Dreze (1995), "Mortality, Fertility, and Gender Bias in India: A District Level Analysis", *Population and Development Review*, 21, pp. 745-782
- Pal, S. (1999), An Analysis of Childhood Malnutrition in Rural India: Role of Gender, Income and Other Household Characteristics, *World Development*, 27, pp. 1151-1171.
- Pitt, M. M., M. R. Rosenzweig and Md. N. Hassan (1990), Productivity, Health and Inequality in the Intrahousehold Distribution of Food in Low-Income Countries, *The American Economic Review*, 80, pp. 1139-1156.
- Sen, A. (1989), Women's Survival as a Development Problem, *Bulletin of the American Academy of Arts & Sciences*, 43, pp. 14-29.
- (1990), More than 100 Million Women are Missing. *The New York Review of Books*, 20 December, pp. 60-66.
- <http://www.who.int/childgrowth/en/> last accessed on 12/12/2014.
- <http://www.who.int/growthref/en/> last accessed on 12/12/2014.