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Assessing Fertility Behaviours In Manipur: Examining The 'Hills'-'Plains' Dichotomy

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Abstract

The latest data from the National Family Health Survey (NFHS-5) indicates that the total fertility rate (TFR) of Manipur is close to replacement level, standing at 2.2 children per woman. However, there's a notable contrast in TFR between the 'hill' and 'plain' regions within the state, which forms the major focus of this paper. Our study has two main objectives: firstly, to discern the determinants of TFR in Manipur and their divergence between the 'hills' and 'plains'; and secondly, to examine whether a preference exists for a specific sex of a child and its impact on a mother's future fertility intentions. Utilizing two econometric models—multiple linear regression and multinomial logistic regression—we reveal that TFR in the 'hill' regions exceeds replacement levels, while the 'plain' regions fall below. Furthermore, socio-demographic factors play a significant role in shaping the total fertility of a mother. Our study identifies that the preference for daughters exists, albeit to a lesser extent than for sons. The presence of at least one son in the family decreases women's future fertility intentions in Manipur.

Keyword: *Total Fertility Rate, Fertility Preference; NFHS; Manipur.*

1. Introduction

The decline in fertility rates since the late nineteenth century has sparked scholarly discourse on its underlying causes (Van de Kaa, 1996). Research has explored various factors influencing this decline, encompassing both macro-level structural variables (Engelhardt et al., 2004; Colleran, 2015; Arpino, 2015) and micro-level human decision-making processes (Eloundou-Enyegue et al., 2012; Caldwell et al., 2015). In addition to the proximate elements of natural fertility, hypotheses such as delayed fertility (Kohler, 2002; Billari et al., 2006), women's educational attainment (Gustafsson, 2001; Happel et al., 1984), increased investment in child quality leading to a trade-off with quantity of children (Becker, 1976) and environmental changes affecting reproductive competency (Aitken, 2022) have been proposed to explain fertility transition.

Globally, the total fertility rate (TFR) has declined from five children per woman in 1950 to 2.5 in 2011, with projections indicating a further decrease to 2.2 by 2050. However, currently in many developed nations, the TFR has already fallen below the replacement level (Prettner, 2013). In India, there has been a significant and steady decline in TFR over the past three decades, from 3.4 in 1992-1993 to 2.0 in 2019–2021 (IIPS & ICF, 2021). Moreover, the General Fertility Rate (GFR) in India has declined by 20 percent over the last decade, with rural areas experiencing a more pronounced decrease (20.2 percent) compared to urban areas (15.6 percent) (Jha, 2022).

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Certain studies, like Lane (2004), have found a positive correlation between declining fertility in women and their level of son preference. The hidden preference for sons during childbearing becomes more apparent when fertility rates decrease, even among educated mothers (Filmer et al., 2008). These studies show that son preference remains prevalent in many countries, with a notable concentration in East Asia, South Asia, the Middle East, North Africa (Arnold, 1998), and Eastern Europe (Filmer et al., 2008), influencing fertility choices and family dynamics. Interestingly, other studies indicate that while female literacy has a negative impact on fertility (Drèze & Murthi, 2001; Hirschman & Rindfuss, 1980; Corijn et al., 1996), the same cannot be said for a high level of education among male partners. This discrepancy in male behaviour is attributed to preferences for sons and concerns about family name continuity (Akin, 2005).

Manipur, situated in the Northeast India region[1], witnessed a significant population growth of 2,855,794 representing a 24 per cent increase from 2001 in 2011 Census. The sex ratio of the state stood at 985 females per 1000 males, surpassing the national average of 943 females per 1000 males. The state boasts a total literacy rate of 70.94 percent, with males exhibiting a higher literacy rate at 83.58 percent compared to females at 70.26 percent. Regarding religious demographics, Hindus constitute the majority at 41.39 percent, closely followed by Christians at 41.29 percent, while Muslims and other religions make up 8.40 percent and 8.19 percent, respectively. Geographically, Manipur spans 22,327 square kilometers, with 'hills'[2] covering 90 percent (20,089 square kilometers) and 'plains'[3] occupying the remaining 10 percent (2,238 square kilometers). Bordered by Nagaland to the north, Myanmar (Burma) to the east and southeast, Mizoram to the southwest, and Assam to the west, Manipur is shaped rectangularly with a greater length than breadth. In terms of social category, the proportion of Scheduled Tribes (ST) in Manipur surged to 40 percent in 2011, up from 32 percent in 2001, whereas the non-ST[4] population declined to 60 percent from 68 percent during the same period. Traditionally, ST communities inhabit the hills, while non-ST populations predominantly reside in the plains. Again, the latest data from the National Family Health Survey (NFHS-5) indicates that the total fertility rate (TFR) of Manipur is close to replacement level, standing at 2.2 children per woman. However, there's a notable contrast in TFR between the 'hill' and 'plain' regions within the state, which forms the major focus of our investigation (Appendix 1).

Given these evolving demographic landscape, there is a compelling need for scholarly exploration into fertility trends across the 'hills' and 'plains' of Manipur. The primary focus of our study is based on two objectives; firstly, to discern the determinants of TFR in Manipur and their divergence between the 'hills' and 'plains', and secondly, to examine whether a preference exists for a specific sex of child and its impact on a mother's future fertility intentions.

2.Materials and Methods

2.1. Data

The National Family Health Survey (NFHS-5) of 2019-21 have been used for descriptive and econometric analysis to understand the fertility preferences of married women aged 15-49 years in Manipur.

2.2. Variables

In order to examine the determinants of total fertility of married women aged 15-49 years, a multiple regression equation have been modelled. For this, 'the total number of living children' of married women has been considered as the outcome variable. Predictors includes: fertility preference (want more children, do not want further children, sterile/infecund); place of residence (Hills or Plains); wealth index (poorest, poorer, middle, richer/richest); religion (Hindu, Christian, Muslims, Others); social group (SC, ST,OBC and General); whether currently using any contraceptive (yes or no); sex of first child (first child is son, first child is daughter); respondent currently working or not (yes or no);

respondent highest year of education (continuous); husbands' desire to have more children (both husband &wife want it; husband want more; husband want fewer/unsure).
Secondly, to ascertain whether certain socio-demographic characteristics significantly influence the gender-parity composition of children, we employ a multinomial logistic regression model. For this, women are categorized based on the number and gender composition of their living children across four different scenarios. For instance, if a mother has only one child, there are two possible scenarios: either she has one son and no daughters, or she has only one daughter and no sons. In other words, if the total living children (TC) is one then the total number of living son (TS) is either '0' or '1'.Thus, four distinct scenarios have been generated as follows: case1[TC=1, TS=0; TC=1, TS=1]; case 2[TC=2, TS=0; TC=2, TS=1; TC=2, TS=2], case 3[TC=3, TS=0; TC=3, TS=1; TC=3, TS=2; TC=3, TS=3] and case 4 [TC>=4, TS=0; TC>=4, TS=1; TC>=4, TS=2;TC>=4, TS=3; TC>=4,TS=4]. These various scenarios, grouped into four main categories, have been utilized as the outcome variable to determine if there exists any significant relationship with predictor variables such as fertility intentions (whether they do not want any more children or wish to have more in the future), place of residence (hills/plains), respondent's current age (continuous), and wealth index (poorest, poorer, middle, richer/richest)

2.3. Analytical model

The fertility preference of women does not occur in vacuum, rather it may be driven by various factors at different level. At the first level of our analysis, to examine the potential relationship between the total number of living children of mother and socio-demographic factors, a multiple regression model has been adopted as follows:

$$\hat{Y} = b_0 + b_1 X_1 + b_2 X_2 + \cdots + b_n X_n$$

$\hat{Y}$—Predicted value of the total living children of mother; b_0—Intercept, the value of Y when all the predictor variables (X_1 through X_n) are equal to zero; b_1 ... b_n—Estimated regression coefficients. Each regression coefficient represents the change in the predicted variable '$\hat{Y}$' relative to a one-unit change in the respective independent variable. For instance, b_1 is the change in '$\hat{Y}$' relative to a one-unit change in X_1, while keeping all other independent variables as constant. The same interpretation will apply for the rest of the regression coefficients$b_{2,}$ …. b_n.
On the second level of our analysis, to examine the potential association between a set of predictors and the multi-category nominal outcome i.e., the gender-parity composition of children (case 1 to case 4), a multinomial logistic regression model has been adopted as follows:

$$\text{logit}(p)=\ln\left(\frac{p}{1-p}\right) = a + b_1x_1 + b_2x_2 + b_3x_3 + \ldots..$$

or

$$p = \frac{\exp(a+b_1x_1+b_2x_2+b_3x_3+\ldots\ldots b_nx_n)}{1+\exp(a+b_1x_1+b_2x_2+b_3x_3+\ldots\ldots b_nx_n)}$$

p—Number of possible outcomes related to gender composition from case 1 to case 4. If p represent case 1 then it comprises of possible outcomes of [TC=1, TS=0; TC=1, TS=1]; if p is case 2 then it comprises of possible outcomes of [TC=2, TS=0; TC=2, TS=1; TC=2, TS=2], so and so forth; exp—the exponential of the model; a—intercept or the constant of the equation; b_1 to b_n—the coefficient of the predictor variables.

3. Results

3.1. Sample characteristics

The social and demographic profile of individual women under the age groups of 15-49 years are given in Appendix 2. The study has dropped certain important variables from considering in the analysis due to its small number of observations. For instance, the data

related to the age of women at first marriage has only three observations, decision making parameters of women has only 816 observations and highest year of education for husband has only 880 observations etc. In order to maintain, robustness in the analysis, variables with smaller observations have been dropped out from the study.

3.2. Multiple Regression Analysis

Table 3 presents the coefficients of the multiple regression model used to determine the total number of living children among mothers aged 15-49 years in Manipur. It is observed that as the total number of living children increases, the likelihood of women not desiring further children in the future or being sterile/infecund becomes highly significant. Additionally, the likelihood of having a higher number of children is significantly lower in the plains compared to the hills. In other words, statistically significant evidence suggests that women from the hills in Manipur have a higher probability of having a larger number of children compared to women from the plains. Furthermore, individuals belonging to economically disadvantaged sections of society are more likely to have more children. In terms of religion, Christians and Muslims tend to have a higher number of children than Hindus. Moreover, it is observed that Scheduled Tribes (STs) have a higher probability of having a larger number of children compared to the 'General' category and other groups. The variable 'sex of the first child' is noteworthy, indicating that if the first child is female, it increases the likelihood of subsequent births by 1 compared to those whose first child is male. Thus, our analysis suggests the existence of son preference in Manipur. Obviously, an increasing number of living children and 'not using any contraceptive methods' were negatively significant. Furthermore, women who reported currently working have lower chances of having more children compared to those without a job. Similarly, there is a negative relationship between increasing age of women and the total number of living children. The analysis reveals that the husband's desire to have more children has a positive relationship with the fertility of their spouse.

Table 3: Coefficient of multiple regression model for determining the total living children of mothers aged 15-49 years

Number of Observation=4,549; Prob>F=0.0000; R-squared=0.6055; Adj R-squared=0.6037; Root MSE=0.48572

Dependent variable: Total living children	Coeff.	Std.Err.	t	[95 % Conf. Interval]	
Fertility Preferences					
Want further children (Ref.)	1				
Do not want further children	1.150269***	.0314786	36.54	1.088555	1.211982
sterile/infecund	.9924136***	.0523452	18.96	.8897915	1.095036
Place of Residence					
Hills (Ref.)	1				
Plains	-.1842618**	.0688448	-2.68	-.3192311	-.0492925
Wealth index					
Richer/richest (Ref.)	1				
Poorest	.4072594***	.0451527	9.02	.3187381	.4957806
Poorer	.2368096***	.0423283	5.59	.1538256	.3197937
Middle	.1778573***	.0457273	3.89	.0882096	.267505
Religion					
Hindu (Ref.)	1				
Christian	.3279341**	.0958482	3.42	.1400249	.5158433
Muslims	.6533232***	.0527885	12.38	.5498321	.7568144
Others	-.0221081	.0720213	-1.01	-.062346	.2182357

Social Group					
General	1				
SC	.0915723	.0881967	1.04	-.081317	.2644616
ST	.5394589***	.0483263	11.16	.4447264	.6341914
OBC	-.0194877	.0682323	-0.29	-.1532414	.1142659
Sex of First Child					
First child is son (Ref.)	1				
First child is daughter	.0510096*	.0279544	1.82	-.0037946	.1058139
Respondent currently working or not					
No(Ref.)	1				
Yes	-.0772109	.0720666	-1.07	-.064286	.2187079
Whether currently using any contraceptive					
Yes (Ref.)	1				
No	-1.667287***	.0400097	-41.67	-1.745718	-1.588856
Respondent highest Year of Education	-.0724344**	.022977	-3.15	-.1175519	-.0273168
Husband desire to have more children					
Both husband and wife want it	1				
Husband wants more	.1668578**	.0676841	2.47	.0341629	.2995527
Husband wants fewer/unsure	.0458307	.1188643	0.39	-.1872033	.2788646
_Const	1.23954	.0813565	15.24	1.080041	1.399038

Source: Authors calculation

3.3. Multinomial Logistic Regression Analysis

Table 4 displays the coefficients of the multinomial logistic regression model used to determine the gender-parity composition of children in Manipur. The base outcome of the analysis is considered as [TC=2&TS=2]. In case 1 and case 2, where TC=1 and TC=2, it is observed that the likelihood of women desiring more children in the future is positively significant regardless of the presence or absence of sons in the composition of total living children. However, the significance level is higher in the absence of sons compared to the presence of sons. This suggests that while daughters are also preferred, the preference for sons appears to be stronger. This is evident when TC=3 and TS=0; the willingness of women to have more children in the future becomes positively significant. However, in subsequent scenarios where sons are present in the composition, the willingness to have more children in the future becomes negatively significant. This indicates that up to the point where TC=1 and TC=2, the preference for daughters, though lower than for male children, appears to exist. However, as the total number of children increases with at least one son in the composition, the likelihood among women of wanting more children in the future decreases. This trend is observed in all four cases.

Furthermore, examining the geographical division between the hills and plains of Manipur, it is found that women from the plains are more likely to have only one male child compared to women from the hills. Women in the plains are less likely to have more children compared to those in the hills. For example, our analysis shows that women from the plains are less likely to have additional children when TC>=3. Additionally, considering the factor of age, the likelihood of having only one child decreases with increasing age, while the likelihood of having more children increases with age.

Regarding the wealth index variable, it is observed that those with only one child are less likely to belong to the poorer and middle-class sections compared to those belonging to the richer/richest group. This suggests that those with one child have a higher likelihood of belonging to the better-off segment of society in Manipur. However, as the number of children increases, the likelihood of individuals belonging to the worse-off section of society becomes higher.

Table 4: Coefficient of multinomial logistic regression model for determining the gender-parity composition of children

Fertility outcomes ⟹	**Total living children=1 [Case 1]**		**Total living children=2 [Case 2]**		**Total living children=3 [Case 3]**				**Total living children=4&more `[Case 4]**				
Predictors	**TC=1, TS=0**	**TC=1, TS=1**	**TC=2, TS=0**	**TC=2 TS=2**	**TC=3 TS=0**	**TC=3 ,TS=1**	**TC=3, TS=2**	**TC=3, TS=3**	**TC>=4, TS=0**	**TC>=4, TS=1**	**TC>=4, TS=2**	**TC>=4, TS=3**	**TC>=4, TS=4**
Fertility Intension													
Do not want any more children (Ref.)	1	1	1	1	1	1	1			1	1	1	1
Want more in the future	1.79*** [.14]	1.62** [.12]	1.24*** [.15]	.33* [.15]	.77** [.26]	-.48** [.18]	-.63** [.19]			-.64** [.22]	-1.3*** [.24]	-1.59*** [.33]	-1.14* [.44]
Place of Residence													
Hills (Ref.)		1				1	1	1	1	1	1	1	1
Plains		.56*** [.13]				-.45** [.13]	-.82*** [.13]	-.77** [.22]	-1.1** [.32]	-1.1*** [.15]	-1.5*** [.14]	-1.6*** [.16]	-1.8*** [.24]
Respondent's Current age(Contd.)	-.07*** [.01]	-.06*** [.009]		.029** [.01]	.03* [.01]	.039*** [.01]	.055*** [.01]	.045** [.015]	.093*** [.022]	.091*** [.011]	.103*** [.01]	.11*** [.012]	.149*** [.017]
Wealth Index													
Richer/rich(Ref.)	1	1			1	1	1	1	1	1	1	1	1

Poorest				.97* [.39]	.61** [.20]	.72** [.21]	.94** [.33]	1.57** [.57]	1.59** [.25]	1.72** [.24]	2.1** [.29]	1.93** [.41]
Poorer	-.33* [.16]	-.28* [.15]	.29 [.17]		.41* [.18]	.59** [.19]		1.28** [.55]	.94*** [.24]	1.2** [.23]	1.2** [.29]	1.1** [.41]
Middle		-.45** [.16]				.44* [.21]			.61* [.26]	.57* [.25]	.76* [.32]	.73* [.44]
Constant	1.03 [.39]	.91 [.35]	-2.2 [.40]	-4.2 [.75]	-2.1 [.41]	-2.7 [.42]	-3.6 [.68]	-6.7 [1.1]	-4.7 [.49]	-4.7 [.45]	-5.8 [.54]	-7.8 [.80]

Dependent Variable: Gender composition of total living child (Base category=[TC=2 and TS=1]); No. of obs=4641; prob>chi2=0.0000; Psuedo R2=0.504; Log likelihood=-10075.16

4. Summing up

In1989-99, the TFR stood at 4.5, which was higher than the national average. However, by 2019-2021, it had nearly aligned with the national average, reaching 2.2 per woman, almost at the replacement level. However, a deeper analysis of TFR at the district level reveals stark disparities. In both the 2015-16 and 2019-21 NFHS rounds, the TFR in the hill districts of Manipur exceeded that of the 'plains'. Despite some reduction, 'hill' districts like Tamenlong and Ukhrul districts maintained relatively high TFRs which were much higher than the replacement level. On the other hand, district that belongs to 'plain' areas like Bishnupur and Thoubal hovered around replacement level, with Imphal West and Imphal East dipping much below the replacement level. These variations in TFR are further highlighted across age cohorts, religious groups, and wealth indexes. For instance, TFR tends to decrease with women's advancing age, while Muslims and Christians consistently exhibit higher TFRs compared to Hindus and 'others', reflecting enduring socio-demographic disparities. Additionally, although TFR has decreased across all economic strata over time, the gap remains, with the richest group maintaining relatively stable TFR levels at 2 in all the NFHS rounds.

Our analysis shows that the increase in total living children significantly reduces the likelihood of women wanting more children in the future or being infecund. Women in the 'hills' of Manipur have a higher probability of having more children compared to those in the 'plains'. Economically disadvantaged individuals tend to have more children, and Christians and Muslims have more children than Hindus. The sex of the first child also plays a role, with female first children associated with a higher likelihood of subsequent births. This indicates the presence of son preference in Manipur. Women who are currently employed are less likely to have more children. Again, the husbands' desire for more children is positively related to their spouses' fertility.

Furthermore, when TC=1 and TC=2, women exhibit a notable inclination towards having more children in the future, irrespective of whether they have sons or not among their existing children. However, this inclination is more pronounced when sons are absent compared to when they are present, suggesting a stronger preference for sons. This preference becomes evident when TC=3 and TS=0, as women's willingness to have more children remains significant. Conversely, in subsequent scenarios where sons are part of the composition, the desire for additional children diminishes. This implies that while a preference for daughters exists, albeit to a lesser extent than for sons, the presence of at least one son in the family decreases the likelihood of women wanting more children in the future.

Notes:

1 The Northeast region of India comprises of eight states including Arunachal Pradesh; Assam; Mizoram; Nagaland; Manipur; Meghalaya; Tripura and Sikkim.
2 As per the NFHS-5, 'Hills' includes the districts of Senapati, Tamenlong, Churchanpur, Chandel and Ukhrul.
3 'Plains' of Manipur includes the districts of Bishnupur, Thoubal, Imphal West and Imphal East.
4 Non-STs includes Schedule Caste (SCs), Other Backward Classes (OBCs) and General category.

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Appendices

Appendix 1: Total Fertility Rate (TFR) of Manipur based on different NFHS rounds

	NFHS-2	NFHS-3	NFHS-4	NFHS-5
TFR of Manipur	4.5	2.8	2.6	2.2
TFR (at district Level)				
Senapati	NA	NA	3	3
Tamenlong	NA	NA	3.8	2.8
Churchanpur	NA	NA	3	3
Chandel	NA	NA	3	2.5
Ukhrul	NA	NA	3.4	3.3
Bishnupur	NA	NA	2.4	2
Thoubal	NA	NA	2.5	2
Imphal West	NA	NA	2.2	1.7
Imphal East	NA	NA	2.1	1.9
ASFR				
20-24 years	1.8	1	1	0.8
25-29 years	2.3	1.6	1.5	1.2
30-34 years	1.8	1.5	1.3	1.1
35-39 years	1.3	0.9	0.7	0.7
40-44 years	0.3	0.4	0.3	0.2
45-49 years	0.1	0.04	0.05	0.02
TFR (by religion)				
Hindu	3.8	2.3	2.2	1.7
Muslim	5.6	3.5	2.6	2.3
Christian	5.4	3.7	3.2	2.9
Other religion	3.9	2.6	2.6	1.7
TFR (by wealth index)				
Poorest	NA	6.3	3.8	2.7
Poorer	NA	3.8	2.7	2.2
Middle	NA	3.1	2.3	1.9
Richer	NA	2.2	2.3	1.8
Richest	NA	2	2.3	2

Source: NFHS-2 TO NFHS-5

Appendix 2: Descriptive Statistics of the sample

Descriptive Statistics	Number	Percentage[mean]
Mean number of children ever born	8,042	1.7 [0, 13]
Mean age of respondents	8042	31[15, 49]
Mean value of total Child ever born	8042	1.6[0,13]
Mean value of total living son	8,042	0.8[0,8]
Mean value of total living daughter	8,042	0.8[0,8]
Fertility Preferences	5,055	
No longer want any children	3,293	65.15
want more children in future	1,761	34.85

Place of Residence	8,042	
Hills	4,016	49.94
Plains	4,026	50.06
Wealth Index	8,042	
Poorest	1,349	16.78
Poorer	2,691	33.46
Middle	2,008	24.97
Richer/richest	1,993	24.78
Religion	8042	
Hindu	3,496	43.47
Christians	2,087	25.96
Muslims	978	12.17
Other religions	1479	18
Social Group	7,744	
SC	527	6.79
ST	3,947	50.84
OBC	1,048	13.5
General	2,212	29
Mean value of highest year of education for respondent	7,269	4[0,8]
Whether currently using any contraceptive	8042	
Yes	4,861	39.55
No	3,181	60.45
Husband desire for future children	5,009	
Both husband and wife want it	3,915	78.18
Husband wants more	703	14.14
Husband wants fewer/unsure	389	8
Sex composition of total living children#	5,201	
Case 1 [TC=1, TS=0; TC=1, TS=1]	1231	23.6
Case 2 [TC=2, TS=1; TC=2, TS=1; TC=2, TS=2]	1633	31.2
Case 3 [TC=3, TS=0; TC=3, TS=1; TC=3, TS=2; TC=3, TS=3]	1057	20
Case 4 [TC>=4, TS=2; TC>=4, TS=3; TC>=4, TS=4]	1280	24.2

Source: NFHS-5

TC=Total number of living children; TS=Total number of living son/s