JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

COMPONENTS OF POPULATION DYNAMICS IN HIMACHAL PRADESH

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Abstract: This study has been undertaken to study components of population dynamics in Himachal Pradesh. Multiple regression analysis shows that included explanatory variables account for 81 percent and 77 percent variation in the dependent variable total number of children ever born (TCEB) for tribal and non-tribal regions, respectively. As current age of women in comparison to lower age group increases, holding other variables constant, fertility increases, as noticed for both regions. Keeping other variables unchanged, age at marriage of women has been found bearing inverse relationship with fertility. Educational standard of ever-married women has adverse effect on fertility in both regions. Women whose husbands are employed have borne on an average fewer children as against those who work in agriculture (for tribal region). The results in tribal region obtained by applying logistic regression on migration status reveal that estimates of sex (male with respect female), higher education with educational level less than matric, standard of living (as against lower one) and Buddhist beside Hindu are statistically significant, and have direct effect on migration. Marital status (married as against unmarried) has adverse effect, that unmarried population migrate more than married one. Results for non-tribal reveals that, holding other variables constant, male population migrates more than female one. Scheduled caste population migrates less than general caste. The risk of mortality is higher in the first year of life than later in childhood. Mother's higher level of education has shown negative effect on child mortality rate. Infant female mortality is higher than male mortality. Infant mortality varied inversely with total number of children born.

Keywords: Fertility behaviour, Logistic regression analysis, Migration, Tribal and non-tribal region, Child mortality, Infant mortality,

1. Introduction

Fertility, mortality and migration are three components that affect population change. The rate of growth of population reflects the difference in the rates of change in birth rates, and death rates (Meashom, 1999: 1359) and migration plays an important role in the population dynamics of the country. In population

dynamics fertility and mortality bring about natural population change, where fertility is a positive force through which the population expands, counteracting the forces of attrition caused by mortality (Bhende & Kanitkar, 1997: 200), whereas migration causes redistribution of population in region or area. Demographic studies are not merely concerned with human beings but also with the social and economic factors which have direct or indirect impact on the growth of population, especially through change in fertility, mortality and migration trends and differentials.

Fertility behaviour indicates the actual reproductive performance of a woman, or a group of women (Gosh, 1989: 17). Human fertility is a complex process and is responsible for the biological maintenance of society. Within the biological limits of human fertility, several social, economic, cultural, psychological and political factors are responsible for determining the levels and differentials of fertility. Infant and child mortality are determined by both the biological endowment of children at birth and their environment after birth. In developing countries, background characteristics such as mother's literacy, rural-urban residence and household economic status and mother's fertility behaviour such as mother's age at childbirth, child's birth order, and previous and following birth intervals are known to affect neonatal, post neonatal, infant and child mortality (Pande, 1998: 17).

The study of migration occupies an important place in population studies, because in combination with fertility and mortality, it determines the size and rate of population growth, as well as its structure and characteristics. The nature of migration as a factor affecting population size is different from that of fertility and mortality. Migration is not a biological variable while both fertility and mortality operate within biological framework, though social, cultural, economic and political factors do operate and exercise some influence on it. The changes in population size and structure caused by fertility and mortality are never drastic, but migration may increase or decrease the size and change the structure of any population drastically at any point of time.

A population policy would address itself both to the situation arising out of fast rising population in any country or area as well as out of declining population in any particular area. The important issues of population policy are primarily to reduce fertility and mortality and to manage redistribution of population. It is not a policy that denies couples to have (bear) children; it aims at securing better economic future for those who are already there. The future population is to be so planned that the present and future of the existing numbers are not adversely affected. It aims at giving chances to all those already born to live well.

2. Methodology

2.1 Objectives

The present study has been undertaken to achieve the following objectives:

1. To find out the determinants of fertility behaviour of ever-married women;
2. to assess the determinants of migration;
3. to find out the determinants of infant and child mortality.

2.2 Hypotheses

On the basis of findings of earlier studies, theoretical frame work and the objectives under consideration, following hypotheses have been generated:

1. The higher levels of mother's education may exhibit a negative relationship with fertility and prevalence of infant mortality.
2. Fertility and infant mortality is likely to be higher among agricultural workers than those employed.
3. Higher household income/better socio-economic status may be associated with lower fertility and lower risk of infant and child mortality.
4. Age at marriage may exhibit an inverse relationship with fertility level and infant mortality i.e., lower the age at marriage, higher may be fertility, whereas higher the age at marriage, lower may be the infant mortality.
5. Shorter the duration of birth interval, higher may be risk for the survival of infants.
6. Migration/out-migration may be higher among younger and unmarried population.
7. Out-migration among rural population is likely to be higher than urban population.
8. Out-migration is likely to be male-dominant.

2.3 Sampling design

The entire sample for the study has been designed in such a manner that statistical estimates of components of population dynamics in Himachal Pradesh can be determined. In order to analyse interrelationship and determinants of migration, fertility behaviour and mortality; data have been collected from Himachal Pradesh. A systematic, multi-stage stratified random sampling design has been adopted to collect data. In sampling procedure region, district, block, panchayat, village, town, ward and household are the different stages of random sampling. For this purpose, two districts i.e. Lahul & Spiti (tribal region) and Una(non-tribal region) out of twelve districts in Himachal Pradesh have been selected following simple random sampling, while arranging them in ascending order on the basis of their respective population. The entire sample for the study has been designed in such a manner that comparison can be made according to region (tribal and non-tribal regions), residence (rural and urban areas in non-tribal region) and migration status (migrant and non-migrant).

Sample selection in tribal region

Lahul & Spiti is tribal region and there is no urban area in this district. In Lahul & Spiti district, there are two development blocks i.e. Lahul and Spiti, and one sub-development block i.e. Udaiypur, according to 2001 census. In order to collect data from tribal region, Lahul development block and Udaipur sub-development block (from two development blocks and one sub-development block), two panchayats from each block and sub-block and two villages from each panchayat have been selected following simple random sampling, while arranging blocks & sub-block, panchayats and villages in ascending order on the basis of their respective population. A sample of ten households has been selected from each village, and 80 households have been actually surveyed from eight villages in tribal region. In 80 interviewed households, data for 101 eligible ever married women aged 15-49 have been collected.

Sampling selection in non-tribal region

Una is a non-tribal region and data have been collected from both rural and urban areas. For urban areas, two urban areas (i.e. Una and Mehatpur), and from each urban area two wards have been selected following simple random sampling, while arranging urban areas and wards in an ascending order on the basis of their respective population. From four wards, data from total forty households have been collected, while selecting ten households from each ward. From 40 interviewed households, data for 45 eligible ever married women aged 15-49 have been collected.

In order to collect data from rural areas, two blocks (i.e. Una and Bangana) have been selected out of total five blocks, two panchayats from each block, and two villages have been selected from each panchayat following simple random sampling, while arranging blocks, panchayats, and villages in ascending order on the basis of their respective population. From eight villages, data for total eighty households have been collected, while selecting ten households from each village. In rural area, from 80 interviewed households, data for 99 eligible ever married women aged 15-49 have been collected. A total sample comprises 200 households and 245 ever-married women aged 15-49 from both tribal and non-tribal regions.

3. Fertility behaviour

This section has been divided into two sub sections. Section 3A deals with the number of children ever born by number of women, whereas econometric analysis of fertility behaviour has been attempted in section 3B.

3A. Number of children ever born by number of women

For the purpose of present study, fertility has been measured as the number of total children ever born to ever-married women, and is based on their complete birth history.

Table 3A Percentage distribution of ever-married women according to number of children ever born

Number of children ever born	Number of women											
	Tribal			Non-tribal								
				Rural			Urban			Total		
	Migrant	Non-migrant	Total	Migrant	Non-migrant	Total	Migrant	Non-migrant	Total	Migrant	Non-migrant	Total
0	9.7	8.6	8.9	0.0	5.6	5.1	11.1	2.8	4.4	5.3	4.8	4.9
1	51.6	27.1	34.7	20.0	6.7	8.1	0.0	13.9	11.1	10.5	8.8	9.0
2	22.6	17.1	18.8	80.0	47.3	50.5	55.6	63.8	62.3	68.4	52.0	54.2
3	16.1	24.3	21.8	0.0	24.7	22.2	22.2	16.7	17.8	10.5	22.4	20.8
4	0.0	12.9	8.9	0.0	10.1	9.1	11.1	2.8	4.4	5.3	8.0	7.6
5	0.0	8.6	5.9	0.0	2.2	2.0	0.0	0.0	0.0	0.0	1.6	1.4
6	0.0	1.4	1.0	0.0	3.4	3.0	0.0	0.0	0.0	0.0	2.4	2.1
Total percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of women	31	70	101	10	89	99	9	36	45	19	125	144

Table 3A shows the distribution of children ever born by number of women in study areas. In study area, all ever-married women have reported less than seven children ever born. Fifty-three percent of non-migrant women in tribal region and 66 percent in non-tribal region (60 percent in rural areas and 80.5 percent in urban areas) have reported less than three children ever born. Eighty-four percent of migrant women in tribal region and all in rural areas of non-tribal region reported less than three children ever born. The percentage of non-migrant women who reported four or more children ever born is higher in tribal region (22.9 percent) as compared to non-tribal region as a whole (12 percent). Further, the percentage of non-migrant women who have reported four or more children ever born is higher in rural areas (15.7 percent) as compared to urban areas (2.8 percent).

3B. An econometric analysis of fertility behaviour

Fertility is determined by an array of social, economic, demographic, cultural and psychological variables, the relative contribution of each of these variables cannot be assessed unless these are examined together with the help of a multivariate analysis technique. Therefore, multiple regression analysis (linear functional form of model) has been applied, considering number of children born to ever-married women as dependent variable, and selected social, economic and demographic variables as independent variables. Socio-economic variables include religion, caste and education of women and spouse, household standard of living index, household agricultural land holdings and occupation of husband; whereas age of women at marriage, current age of women, average of preceding child birth intervals, number of infant and child deaths and number of female children alive constitute demographic variables.

3B.1 Correlation

If multicollinearity is perfect, the regression coefficients are indeterminate and their standard errors are infinite. If multicollinearity is less than perfect, the regression coefficients, although determinate, possess large standard errors (in relation to the coefficients themselves), that means the coefficients cannot be estimated with great precision or accuracy. In order to find multicollinearity the pair-wise or zero-order correlation coefficients between different variables have been computed.

3B.1.1 Correlations in tribal region

Table 3B.1.1.1 Correlations in tribal region

Variable	HLND	SLI	THINC
HLAND	1	0.690**	0.392**
SLI	0.690**	1	0.521**
THINC	0.392**	0.521**	1
Number of women	101	101	101

** Correlation is significant at 0.01 level (2-tailed)

Where,

HLAND= Household agricultural land

SLI= Household standard of living index

THINC= Total household income

Table 3B.1.1.1 gives the pair wise correlation matrix of some of the explanatory variables in tribal region. The entries off the main diagonal give pair-wise correlations among household land, standard of living index and total household income variables. Pair-wise correlations are quite high, showing severe collinearity problem. Thus, in order to avoid multicollinearity problem in the model, household land and standard of living index variables as such have been dropped. Household land and standard of living index have been included in the form of grouped category in the stepwise analysis.

Table 3B.1.1.2 Correlations in tribal region

Variable	WCAGE	AGMAR	DURMAR
WCAGE	1.000	0.109	0.879**
AGMAR	0.109	1.000	-0.379**

DURMAR	0.879**	-0.379**	1.000
Number of women	101	101	101

** Correlation is significant at 0.01 level (2-tailed)

Where,

WCAGE= Current age of women

AGMAR= Age of women at marriage

DURMAR= Duration of marriage of women

Table 3B.1.1.2 shows the pair wise correlation matrix in tribal region among current age of women, age of women at marriage and duration of marriage of women. Pair-wise correlations are quite high that shows severe collinearity problem. Thus, in order to avoid multicollinearity in model, duration of marriage of women as explanatory variable has been dropped and current age of women and age of women at marriage have been included as explanatory variables.

3B.1.2 Correlations in non-tribal region

Table 3B.1.2.1 Correlations in non-tribal region

Variable	HLND	SLI	THINC
HLAND	1.000	0.228**	0.227**
SLI	0.228**	1.000	0.440**
THINC	0.227**	0.440**	1.000
Number of women	144	144	144

** Correlation is significant at 0.01level (2-tailed)

Table 3B.1.2.1 gives the pair wise correlation matrix in non-tribal region. The entries off the main diagonal give pair-wise correlations among household land, standard of living index and total household income variables. Pair-wise correlations are quite high which shows severe collinearity problem. Thus in order to avoid multicollinearity problem between variables in the model, household land and standard of living variables have been dropped and total household income in the form of categorical variable has been taken into account as explanatory variable.

Table 3B.1.2.2 shows the pair wise correlation matrix in non-tribal region among current age of women, age of women at marriage and duration of marriage of women. Pair wise correlations are quite high indicating severe collinearity problem. Thus, in order to avoid multicollinearity in model, duration of marriage of women as explanatory variable has been dropped and current age of women and age of women at marriage have been included as explanatory variables.

Table 3B.1.2.2 Correlations in non-tribal region

Variable	WCAGE	AGMAR	DURMAR
WCAGE	1.000	-0.125	0.939**
AGMAR	-0.125	1.000	-0.460**
DURMAR	0.939**	-0.460**	1.000
Number of women	144	144	144

** Correlation is significant at 0.01level (2-tailed)

3B.2 Regression analysis of determinants of number of children ever born (TCEB)

There are two linear regressions, the first regression runs for the tribal sample and second, for the non-tribal sample.

The model for the tribal sample is postulated as:

$TCEB_t = b_o + b_1TCDEATH + b_2FLIVING + b_3RELIGION + b_4CAST\ SC + b_5WCURAGE2 + b_6WCURAGE3 + b_7WAGATMAR2 + b_8WAGATMAR3 + b_9WEDMAT + b_{10}WEDAMAT + b_{11}HEMP + b_{12}HBUS + b_{13}MGSTATUS + u_t$

The model for the non-tribal sample is postulated as:

$TCEB_{nt} = \beta_o + \beta_1TCDEATH + \beta_2FLIVING + \beta_3RELIGION + \beta_4RESIDENCE + \beta_5CAST\ SC + \beta_6CASTOBC + \beta_7WCURAGE2 + \beta_8WCURAGE3 + \beta_9WAGATMAR2 + \beta_{10}WAGATMAR3 + \beta_{11}WEDMAT + \beta_{12}WEDAMAT + \beta_{13}HEMP + \beta_{14}HBUS + \beta_{15}MGSTATUS + \beta_{16}AVBRINT + \beta_{17}THINC2 + \beta_{18}THINC3 + u_{nt}$

Where,

Dependent variable for tribal region is $TCEB_t$ and explanatory variables are:

TCDEATH- Number of total child deaths

FLIVING- Number of total female children alive

RELIGION- Buddhist = 1, 0 otherwise

RESIDENCE- Urban = 1, 0 otherwise

CASTSC- Scheduled caste = 1, 0 otherwise

CASTOBC- OBC= 1, 0 otherwise

WCURAGE2- Current age of women (20-29 years) = 1, 0 otherwise

WCURAGE3- Current age of women (30-39 years) = 1, 0 otherwise

WAGATMAR2- Age of women at marriage (20-24 years) = 1, 0 otherwise

WAGATMAR3- Age of women at marriage (25+ years) =1, 0 otherwise

WEDMAT- Educational level of women (Matric) = 1, 0 otherwise

WEDAMAT- Educational level of women (above matric) =1, 0 otherwise

HEMP- Husband employed= 1, 0 otherwise

HBUS- Husband engaged in business = 1, 0 otherwise

MGSTATUS- Migrant= 1, 0 otherwise

AVBRINT- Average of previous child birth intervals

THINC2- Total household income (1-3 Lakh) = 1, 0 otherwise

THINC3- Total household income (Above 3 Lakh) =1, 0 otherwise

Units of THINC2 and THINC3 are in thousand.

Dependent variable for non-tribal region is $TCEB_{nt}$ and explanatory variables are the same as above except for:

RELIGION- Sikh = 1, 0 otherwise

Here b_0 and β_o are intercepts, and b_i's and β_i's (i=1….14) are parameters (to be estimated) of the corresponding explanatory variables and u_t and u_{nt} are stochastic terms in tribal and non-tribal samples, respectively.

Linear regression has been applied for the analysis of fertility behaviour, and outcome of analysis is presented in table 3B.2. To compare the results, the outcome of regression analysis for both regions- tribal and non-tribal has been given in the same table. The included explanatory variables account for 81 percent and 77 percent variation in the dependent variable (TCEB) for tribal and non-tribal regions, respectively.

Table 3B.2 Regression analysis for tribal and non-tribal samples

Variable	Tribal region		Non-tribal region	
	B	**p-value**	B	**p-value**
TCDEATH	0.881	0.000	0.757	0.000
FLIVING	0.573	0.000	0.545	0.000
RELIGION	0.058	0.711	-0.085	0.667
RESIDENCE	-	-	-0.023	0.094
CAST SC	-0.004	0.990	0.342	0.008
CASTOBC	-	-	-0.076	0.564
WCURAGE2	0.445	0.021	0.471	0.001
WCURAGE3	1.173	0.000	0.764	0.010

WAGATMAR2	-0.599	0.002	-0.254	0.013
WAGATMAR3	-0.761	0.000	-0.500	0.007
WEDMAT	-0.567	0.026	-0.383	0.002
WEDAMAT	-0.488	0.015	-0.333	0.013
HEMP	0.319	0.059	0.006	0.952
HBUS	0.147	0.536	-0.184	0.176
MGSTATUS	-0.340	0.067	0.046	0.826
AVBRINT	-	-	-0.060	0.050
THINC2	-	-	0.185	0.133
THINC3	-	-	0.148	0.254
CONSTANT	1.422	0.000	1.787	0.000
Value of R^2	0.813		0.774	
Value of $\overline{R}^2$	0.785		0.734	
N	101		144	

Estimates of current different included current age groups and age at marriage of ever married women give correct signs and are statistically significant for both regions. As current age of women in comparison to lower age group increases, holding other variables constant, fertility increases, as noticed for both regions. Keeping other variables unchanged, age at marriage of women has been found bearing inverse relationship with fertility, lower is the age at marriage, higher is the fertility and this result supports hypothesis. The fertility of scheduled caste ever married women is higher by 0.34 as compared to that of general category in non-tribal region and remains unaffected in tribal region. Religion does not affect fertility at all, as evident for both regions. Educational standard of ever-married women has adverse effect on fertility, higher the educational level, the lower the fertility is as seen in both regions and it approves the hypothesis. Migrant women in tribal region have significantly lower fertility as compared to non-migrant women, whereas migration status of women does not affect fertility in non-tribal region, though it is marginally higher for migrant women but insignificant. Tribal region does not have urban areas, whereas urban ever-married women of non-tribal region have lower fertility than those of rural women. Lastly, a finding that women whose husbands are employed have borne on an average fewer children as against those who work in agriculture (for tribal region) supports the hypothesis. Higher child birth intervals (spacing between child births) lower the fertility approves the hypothesis, as evident for non-tribal women.

Holding other variables unchanged increasing average child birth interval by one year, decreases the fertility by 0.06 child. Estimates of total number of child deaths and number of female children alive are statistically highly significant, and are directly related to fertility, for both regions. Keeping other variables

fixed, as the number of total child death rises by one, fertility increases by 0.88, whereas increase in number of female children alive by one increases fertility by 0.57 (among women of tribal region). The same pattern is observed among ever-married women in non-tribal region. Considering significant estimates of included regressions (such as total number of deaths, female children alive, age at marriage, and current age of women) for both regions, the mean number of children ever born would be lower for women of higher age at marriage and lower current age, and that of higher educational level.

The estimates of included regressors, namely, number of female children alive, total child deaths, current age of women (aged 30-39 years) and age (25-29 years) at marriage of ever-married women in tribal region are highly significant. The estimates of number of children alive, and number of child deaths are directly related to total number of female children born alive, the increase in fertility by changing these each by one unit, increases the fertility by 0.65 and 0.93 units, respectively (tribal region). The increase in fertility has been noticed to be higher in tribal than non-tribal region.

4. Migration

This section has been divided into two sub sections. Section 4A, throws a light on migration rate; whereas section 4B presents an econometric analysis of migration.

4A. Migration status

In this study, movements that resulted in the change of usual place of residence (UPR)[1] of the individuals have been treated as migration, and a household member whose last usual place of residence (UPR) was different from present place at the time of enumeration has been considered as migrant. The other types of movements that do not involve change of usual place of residence, but are short-term (less than six months) or seasonal in nature have not been considered. The changes of usual place of residence of women due to marriage have been excluded from being treated as migration in this study. Characteristics of sampled migrants belong to the time when they migrated whereas current characteristics of non-migrants have been considered.

Table 4A indicates distribution of migrants (out-migrants, in-migrants and return-migrants) and non-migrants according to residence and region. Any former member of the household who left the household, any time in the past, for stay outside the village/town, has been considered as out-migrant, provided he/she was alive as on the date of study. In this study information about out-migrant member(s) of the household has been collected from each of the selected household. But information about out-migration of entire household from a village/town could not be collected in this study. In present study, a phenomenon in which the migrants return to their earlier usual place of residences (UPR) from where they had migrated in the past, and who are intending to stay in their present place for at least six months, is termed as return-migration. Any migrant who reported present place of enumeration as usual place of residence (UPR) in the past has been considered as return-migrant. Any present member of the household whose last place of residence (any time in the past) was

[1]Usual place of residence (UPR) of a person was defined as a place (village/town) where the person had stayed continuously for a period of six months or more.

different from present place of enumeration, outside the village/town, excluding return migrants has been considered as in-migrant.

Table 4A. Percent distribution of migrants and non-migrants by migration status, according to residence and region

Category of persons			Migration status				All	Number of persons
			Non-migrants	Out-migrants	In-migrants	Return-migrants		
Tribal		Male	62.5	30.2	4.4	2.9	100.0	315
		Female	76.7	22.0	1.0	0.3	100.0	287
		Persons	69.3	26.2	2.8	1.7	100.0	602
Non-tribal	Rural	Male	79.9	18.6	0.0	1.5	100.0	274
		Female	95.2	4.8	0.0	0.0	100.0	249
		Persons	87.2	12.0	0.0	0.8	100.0	523
	Urban	Male	80.7	5.5	13.8	0.0	100.0	109
		Female	86.4	1.0	12.6	0.0	100.0	103
		Persons	83.5	3.3	13.2	0.0	100.0	212
	Total	Male	80.2	14.9	3.9	1.0	100.0	383
		Female	92.6	3.7	3.7	0.0	100.0	352
		Persons	86.1	9.5	3.8	0.6	100.0	735

Out-migration rate has been very high in tribal region (26.2 percent) as compared to that in rural (12 percent) and urban areas (3.3 percent) of non-tribal region. In non-tribal region, 13.2 percent are in-migrants in urban areas as compared to no in-migrant in rural areas, whereas in tribal region, only 2.8 percent are in-migrants. Return migration rate is very low in both regions (tribal and non-tribal) and rural-urban areas of non-tribal region.

4B. Logistic regression analysis

Logistic regression, being well suited for analysing dichotomous outcomes, has been increasingly applied in social science research. It has been used to overcome limitation of ordinary least squares (OLS) regression in handling dichotomous outcomes. Logistic regression is applied for studying the relation between a categorical or qualitative outcome variable and one or more predictor variables. The logit is the natural logarithm, (Ln) of odds of outcome variable Y, i.e.

$\text{Ln}\left(\frac{\pi}{1-\pi}\right)$ = log (odds) = logit = $\propto + \beta x_i$

Here π = probability (y = | X = x)

$= \frac{e^{\propto + \beta xi}}{1+e^{\propto + \beta xi}}$

Where, π is the probability of the outcome of the event.

Logit = Natural log of odds

$= \text{Ln}\left(\frac{p}{1-p}\right) = \log_e (\text{odds})$

= logit (p)

Log-likelihood is the value of the log likelihood of a logistic regression model.

Odds $\frac{p}{1-p} \neq$ probability (p) or likelihood

Odds ratio, a measure of association is given as

$$\frac{\frac{p1}{1-p1}}{\frac{p0}{1-p0}}$$

Where p_1 = probability of an event, given the membership in Group 1,

P_0 = probability of an event, given the membership in Group 0,

An odds ratio greater than 1 implies an increased likelihood.

4B.1 Logistic regression analysis for all migrants of tribal region

Independent (explanatory) variables are:

SEX: 1 for male, 0 for female

EDUCATION 2: 1 for matric, 0 otherwise

EDUCATION 3: 1 for above matric, 0 otherwise

RELIGION: 1 for Buddhist, 0 otherwise

SLI 2: 1 for SLI 26-40 score, 0 otherwise

SLI 3: 1 for SLI 41+ score, 0 otherwise

HLAND 2: 1 for land 1-2 hectare, 0 otherwise

HLAND 3: 1 for land 2+ hectare, 0 otherwise

HHTYPE: 1 for joint type of household, 0 otherwise

Dependent variable:

MGSTATUS: 1for migration (migrants), 0 otherwise

Table 4B.1.1 Logistic regression analysis (Tribal region, Migration)

Dependent variable: Migration status (MGSTATUS)

Covariate	B	p-value	Exp (B)
SEX	0.573	0.019	1.773
EDUCATION2	1.040	0.000	2.828
EDUCATION3	1.074	0.000	2.927
MGSTATUS	-2.394	0.000	0.091
RELIGION	0.527	0.061	1.694
SLI 2	0.559	0.060	1.750
SLI 3	1.105	0.006	3.020
HLAND 2	0.740	0.009	2.096
HLAND 3	0.426	0.349	1.532
HHTYPE	-0.255	0.346	0.775
CONSTANT	-1.916	0.000	0.147

-2 log likelihood	**Cox & Snell R^2**
447.092	0.286

Estimation terminated at iteration number 5.

The results (Table 4B.1.1) obtained by applying logistic regression on migration status (MGSTATUS) reveal that estimates of sex (male with respect female), higher education with educational level less than matric, standard of living (as against lower one) and Buddhist beside Hindu are statistically significant, and have direct effect on migration. Migration increases with incremental increase in these independent variables. One unit change in male, educational level, religion and standard of living index, keeping other variables unchanged, changes migration by 0.573, 1.040 - 1.074, 0.527 and 0.559 - 1.105, respectively as compared to their respective base categories. Marital status (married as against unmarried) has adverse effect, that unmarried population migrate more than married one and the differential is about 2.39. Migration among joint type of households is less than nuclear households.

Table 4B.1.2 Probabilities

Covariates	Probability	Odds ratio
Unmarried Buddhist male with HHTYPE	0.24	1.79
Unmarried Hindu male with HHTYPE	0.15	
Unmarried Buddhist male with HHTYPE EDUCATION 3	0.82	1.68
Unmarried Buddhist male with HHTYPE SLI 3	0.73	

Another table 4B.1.2 shows that unmarried Buddhist population (0.24 percent) is likely to migrate more than unmarried Hindu population (0.15 percent) with same type of household. This table 4.1.2 also shows that for unmarried Buddhist males has increased likelihood to migrate than unmarried Hindu males with same type of household (through the probabilities are less than 0.50 for both communities), odds ratio being 1.79. Unmarried Buddhist males are likely to migrate more than unmarried Hindu males with same educational level (above matric), type of household and standard of living index. Odds ratio (1.68) shows that male of Buddhist community has increased likelihood to migrate than male of Hindu. Similar pattern has been seen among out-migrants of tribal region.

4B.2 Logistic regression analysis for all migrants of non-tribal region

Independent (explanatory) variables are:

SEX: 1 for male, 0 for female

EDUCATION 2: 1 for matric, 0 otherwise

EDUCATION 3: 1 for above matric, 0 otherwise

SC: 1 for caste SC, 0 otherwise

OBC: 1 for above OBC, 0 otherwise

RESIDENCE: 1 for urban, 0 for rural

SLI 2: 1 for SLI 26-40 score, 0 otherwise

SLI 3: 1 for SLI 41+ score, 0 otherwise

HHTYPE: 1 for joint type of household, 0 otherwise

Dependent variable:

MGSTATUS: 1 for migration (migrants), 0 otherwise

Table 4B.2.1 Logistic regression analysis (Non-tribal region, Migration) Dependent variable: Migration status (MGSTATUS)

Covariate	B	p-value	Exp (B)
SEX	1.111	0.000	3.037
EDUCATION 2	0.686	0.017	1.985
EDUCATION 3	0.579	0.050	1.784
SC	-1.551	0.000	0.212
OBC	-0.084	0.760	0.920
RESIDENCE	0.143	0.783	1.153
MGSTATUS	-0.497	0.037	0.609
SLI 2	-1.265	0.000	0.282
SLI 3	-0.066	0.817	0.936
HHTYPE	-0.172	0.481	0.842
CONSTANT	-1.893	0.000	0.151

-2 log likelihood	Cox & Snell R^2
479.386	0.11

Estimation terminated at iteration number 6.

Table 4B.2.1 (Non-tribal) reveals that, holding other variables constant, male population migrates more than female one. Educational level of population is statistically significant at 5 percent and is found to be affecting migration directly. Scheduled caste population migrates less than general caste. Urban population migrates more than rural, but level of significance shows that there is hardly any rural-urban differential. Household standard of living index indicates that population of lower level of index migrates relatively more, as the estimate of the parameter is highly significant.

Table 4B.2.2 Probabilities

Covariates	Probability	Odds ratio
Unmarried Rural male with HHTYPE	0.31	1.16
Unmarried Urban male with HHTYPE	0.28	
Unmarried Rural male with HHTYPE EDUCATION 3	0.35	1.53
Unmarried Rural male with HHTYPE SLI 3	0.26	

Another table 4B.2.2 shows that probability of unmarried, rural male population with type of household (joint versus nuclear) has higher probability of migration (0.31 percent) than unmarried urban male population with same type of household (0.28 percent).

5. Infant and child morality

In this study, complete history of births and deaths of child born to all ever-married women age 15-49 has been collected. The information collected has been used to calculate the following direct estimates of infant and child mortality:

Neonatal mortality (NN) - the probability of dying in the first month of life
Post neonatal mortality (PNN) - the probability of dying after the first month of life but before the first birthday
Infant mortality – the probability of dying before the first birthday
Child mortality – the probability of dying between the first and fifth birthdays

5.1 Levels and trends in infant and child mortality

The region is also an important because infant and child mortality vary by region. Tribal region is likely to experience lower mortality than non-tribal region. Levels and trends in infant and child mortality rates for tribal region have been presented in table 5.1.1. These levels and trends relate to the period 2 and 3 years preceding the study as well as those of current period when data for the study have been collected. The cases of mortality decrease, as we go backward in time from the study period. The whole covered area for tribal region is rural. Neonatal mortality among children of non-migrant women has shown a decline over time, it being 21.05 (three years preceding the study) and 16.95 (2 years preceding the survey), and it further declined to present level 12.12 (child deaths per 1000 live births during neonatal period). Child mortality also registered a decline among children of non-migrant women. It declined from 10.53 (three years before the study) to 8.47 (2 years before the survey), however it rose to 12.12 (at present). Infant mortality among children of migrant women (23.26) is lower than those of non-migrant women (30.30).

Table 5.1.1 levels, trends and differentials in infant and child mortality- Tribal region

Years preceding the survey	Neonatal mortality (NN)		Post neonatal morality (PNN)		Infant mortality		Child mortality (1-5 years)	
	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
3 years	0.00	21.05	0.00	0.00	0.00	21.05.	0.00	10.53
2 years	0.00	16.95	0.00	0.00	0.00	16.95	0.00	8.47
Present	0.00	12.12	23.26	18.18	23.26	30.30	0.00	12.12

Table 5.1.2 levels, trends and differentials in infant and child mortality- Non-tribal region

Years preceding the survey	Neonatal mortality (NN)		Post neonatal morality (PNN)		Infant mortality		Child mortality (1-5 years)	
	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Rural								
3 years	0.00	15.27	0.00	30.53	0.00	45.80	0.00	7.63
2 years	0.00	11.49	0.00	40.23	0.00	51.72	0.00	5.75
Present	0.00	18.26	0.00	41.10	0.00	59.36	0.00	4.57
Urban								
3 years	90.91	23.67	0.00	0.00	41.67	47.34	0.00	5.92
2 years	83.33	34.48	0.00	0.00	83.33	34.48	0.00	0.00
Present	50.00	27.78	0.00	0.00	50.00	27.78	0.00	0.00
Total								
3 years	41.67	23.67	0.00	0.00	41.67	47.34	0.00	5.92
2 years	34.48	14.70	0.00	25.74	34.48	47.41	0.00	4.31
Present	26.32	20.62	0.00	30.93	26.32	51.55	0.00	3.44

Results for the non-tribal region reveal (Table 5.1.2) that overall neonatal mortality rate among children of migrants (rural and urban together) has recorded a decline over time, it being 41.67 (three years before the study), it dropped from 34.48 (two years preceding data collection) to 26.32 (present level). Child mortality rate (1-5 years) has also exhibited a declining trend, it being 5.92, 4.32 and 3.44 for respective periods, among children of non-migrant women. Infant mortality of children of non-migrant women has shown a rising trend, varying between 47.34 and 51.55. Infant mortality rate of children of migrants is lower than that of children of non-migrant women, it being 41.67 and 47.34 for children of migrant and non-migrant women (three years preceding the survey), 34.48 and 47.41 (two years preceding the survey) and 26.32 and 51.55 at present.

5.2 Socio-economic differentials in mortality

Table 5.2.1 Mortality by socio-economic characteristics in tribal region

Socio-economic characteristics	Neonatal mortality (NN)		Post neonatal morality (PNN)		Infant mortality		Child mortality (1-5 years)	
	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Religion								
Hindu	0.00	12.12	23.26	18.18	23.26	30.30	0.00	12.12
Buddhist	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Caste								

Scheduled tribes	0.00	12.12	23.26	18.18	23.26	30.30	0.00	12.12
Mother's education								
< Matric	0.00	12.12	23.26	18.18	23.26	30.30	0.00	12.12
Above matric	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard of living								
Low	0.00	12.12	0.00	18.18	0.00	30.30	0.00	12.12
Medium	0.00	0.00	23.26	0.00	23.26	0.00	0.00	0.00
High	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residence								
Rural	0.00	12.12	23.26	18.18	23.26	30.30	0.00	12.12

Table 5.2.2 Mortality by socio-economic characteristics in non-tribal region

Socio-economic characteristics	Neonatal mortality (NN)		Post neonatal morality (PNN)		Infant mortality		Child mortality (1-5 years)	
	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Religion- rural								
Hindu	0.00	18.26	0.00	41.10	0.00	59.36	0.00	4.57
Sikh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Religion- urban								
Hindu	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
Sikh	0.00	27.78	0.00	0.00	0.00	27.78	0.00	0.00
Caste- rural								
General	0.00	0.00	0.00	13.70	0.00	13.70	0.00	0.00
Scheduled caste	0.00	4.57	0.00	18.26	0.00	22.83	0.00	0.00
OBC	0.00	13.70	0.00	9.13	0.00	22.83	0.00	4.57
Caste- urban								
General	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
Scheduled caste	0.00	27.78	0.00	0.00	0.00	27.78	0.00	0.00
OBC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mother's education- rural								
< Matric	0.00	18.26	0.00	41.10	0.00	59.36	0.00	4.57
Above matric	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mother's education- urban								
< Matric	50.00	27.78	0.00	0.00	50.00	27.78	0.00	0.00
Above matric	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard of living- rural								
Low	0.00	0.00	0.00	27.40	0.00	27.40	0.00	0.00

Medium	0.00	9.13	0.00	4.57	0.00	13.70	0.00	0.00
High	0.00	9.13	0.00	9.13	0.00	18.26	0.00	4.57
Standard of living- urban								
Low	50.00	27.78	0.00	0.00	50.00	27.78	0.00	0.00
Medium	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
High	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residence								
Rural	0.00	18.26	0.00	41.10	0.00	59.36	0.00	4.57
Urban	50.00	27.78	0.00	0.00	50.00	27.78	0.00	0.00
Total	26.32	20.62	0.00	30.93	26.32	51.55	0.00	3.44

The risk of mortality is higher in the first year of life than later in childhood. This has been supported by the mortality rates as presented. Table 5.2.1 presents differentials in infant and child mortality rates in tribal region by selected socio-economic characteristics. No mortality is found among children of migrant and non-migrant women of Buddhist community, who have educated more than matric and those of households with high standard of living. Infant mortality rate (30 deaths per 1,000 live births) among scheduled tribes Hindu non-migrants with education less than matric and low standard of living is higher as compared to that among Hindu migrants (23.26 deaths per 1,000 live births). Migrant Scheduled tribal women with educational level less than matric in tribal region reported no child mortality (age 1-4 years) as compared to non-migrant Hindu women (12 deaths per 1,000 live births. Infant mortality is higher than child mortality in tribal region.

Infant and child mortality rates for children of migrant and non-migrant women of rural and urban areas of non-tribal region by socio-economic characteristics have been presented in Table 5.2.2. Selected rural areas have been predominantly inhabited by Hindu community, whereas only two members of non-migrant Sikh Community have been selected in the sample. A neonatal mortality rate of children of rural Hindu non-migrant women (18.26) is lower than that of children of urban Sikh non-migrant women (27.78). Caste wise mortality rates reveal that neonatal mortality rate of children of rural non-migrant women of OBC is two-times higher than that of scheduled caste. Infant mortality of children of non-migrant women of General Category is lower (13.70) as against those of Scheduled caste and OBC (22.83, each). In urban area, infant mortality rate of children of scheduled caste women is lower than that of general caste. Mother's higher level of education has shown effect on child mortality rate, mortality occurs to children of women with less than matric standard of education only. Infant mortality rate is higher among children of rural non-migrant women with low household level of standard of living as compared to women with high household standard of living index. In urban areas of non-tribal region child mortality is prevalent among women with low level of household standard of living index.

5.3 Demographic differentials in mortality

Table 5.3.1 presents infant and child mortality rates by sex of the child, mother's age at delivery (birth of child), child birth interval, total children born and birth order of child. Child mortality rate among male and female children of non-migrant women is evenly distributed. Male infant mortality rate among male children of non-migrant women is three times higher than that of female children. Among women aged less than 20 years at child birth, infant child mortality is higher for migrant women (23.26) as compared to non-migrant women (12.12). Children of non-migrant women has higher infant mortality rate, with average previous birth interval exceeds three years.

Table 5.3.1 Mortality by demographic characteristics in tribal region

Demographic characteristics	Neonatal mortality (NN)		Post neonatal morality (PNN)		Infant mortality		Child mortality (1-5 years)	
	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Sex- rural								
Male	0.00	12.12	23.26	12.12	23.26	24.24	0.00	6.06
Female	0.00	0.00	0.00	6.06	0.00	6.06	0.00	6.06
Mother's age at birth								
< 20	0.00	6.06	23.26	6.06	23.26	12.12	0.00	12.12
20-29	0.00	6.06	0.00	12.12	0.00	18.18	0.00	0.00
30-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average of previous childbirth-intervals								
1 year	0.00	0.00	23.26	6.06	23.26	6.06	0.00	0.00
2-3 years	0.00	6.06	0.00	0.00	0.00	6.06	0.00	6.06
> 3 years	0.00	6.06	0.00	12.12	0.00	18.18	0.00	6.06
Total children ever born								
1-2	0.00	6.06	23.26	0.00	23.26	6.06	0.00	0.00
3-4	0.00	6.06	0.00	12.12	0.00	18.18	0.00	6.06
5+	0.00	0.00	0.00	6.06	0.00	6.06	0.00	6.06
Birth order								
1	23.26	12.12	0.00	6.06	23.26	18.18	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	6.06	12.12
3	0.00	0.00	0.00	0.00	0.00	0.00	6.06	0.00

Table 5.3.2 Mortality by demographic characteristics in non-tribal region

Demographic characteristics	Neonatal mortality (NN)		Post neonatal morality (PNN)		Infant mortality		Child mortality (1-5 years)	
	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant	Migrant	Non-migrant
Sex- rural								
Male	0.0	4.57	0.00	18.26	0.00	22.83	0.00	0.00
Female	0.00	13.70	0.00	22.83	0.00	36.70	0.00	4.57
Sex- urban								
Male	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
Female	0.00	27.78	0.00	0.00	0.00	27.78	0.00	0.00
Mother's age at birth- rural								
< 20	0.00	9.13	0.00	4.57	0.00	13.70	0.00	0.00
20-29	0.00	4.57	0.00	31.96	0.00	36.53	0.00	0.00
30-39	0.00	4.57	0.00	4.57	0.00	9.13	0.00	4.57
Mother's age at birth- urban								
< 20	50.00	13.89	0.00	0.00	50.00	13.89	0.00	0.00
20-29	0.00	13.89	0.00	0.00	0.00	13.89	0.00	0.00
30-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average of previous childbirth-intervals- rural								
1 year	0.00	0.00	0.00	18.26	0.00	18.26	0.00	0.00
2-3 years	0.00	13.70	0.00	22.83	0.00	36.53	0.00	4.57
> 3 years	0.00	4.57	0.00	0.00	0.00	4.57	0.00	0.00
Average of previous childbirth-intervals- urban								
1 year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-3 years	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
> 3 years	0.00	27.78	0.00	0.00	0.00	27.78	0.00	0.00
Total children ever born- rural								
1-2	0.00	4.57	0.00	4.57	0.00	9.13	0.00	0.00
3-4	0.00	4.57	0.00	18.26	0.00	22.83	0.00	4.57
5+	0.00	9.13	0.00	18.26	0.00	27.40	0.00	0.00
Total children ever born- urban								
1-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3-4	50.00	27.78	0.00	0.00	50.00	27.78	0.00	0.00
5+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Birth order- rural								
1	0.00	13.70	0.00	9.13	0.00	22.83	0.00	4.57
2	0.00	4.57	0.00	9.13	0.00	13.70	0.00	0.00
3	0.00	0.00	0.00	9.13	0.00	9.13	0.00	0.00
4	0.00	0.00	0.00	4.57	0.00	4.57	0.00	0.00
Birth order- urban								
1	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00
2	0.00	13.89	0.00	0.00	0.00	13.89	0.00	0.00
3	0.00	13.89	0.00	0.00	0.00	13.89	0.00	0.00

Infant mortality rate is higher for children of non-migrant women with 3-4 children ever born. Fifty percent of mortality occurred in first order (solely infant mortality) in tribal region, followed by second birth order and third order each 6.06. All child deaths (1-5 years) took place in second birth order. Fifty percent of

infant deaths occurred to children of those non-migrants who have borne 3-4 children. Neonatal mortality has been 6.06 each for women who have born 1-2 and 3-4 children, respectively.

Table 5.3.2 shows that among children of rural non-migrant women, female neonatal mortality (13.70) is two-times higher than that of males. Infant female mortality is also higher among rural non-migrant women than male mortality. Only one female child (1-5 years) death has been recorded for rural non-migrant women. In urban areas, the neonatal mortality among children of migrant and non-migrant has been 50.0 and 27.78, respectively.

Infant mortality is more prevalent among children of rural non-migrant women aged 20-29 years at delivery than other age groups. Infant mortality is higher among children of rural non-migrant women with birth intervals 2-3 years (36.53) and one year (18.26), respectively. Infant mortality varied inversely with total number of children born, it being 9.13 for rural non-migrant women who have borne 1-2 children, 22.83 for those with 3-4 children and 27.78 for those who have borne five or above number of children.

6. Policy Implications

The study indicates the need to improve women's status, particularly education and involvement of women in family decision-making for successful reduction in fertility and mortality. This may be achieved through providing education and employment opportunities to women. Health facilities, particularly in rural areas may be increased so that effort would be an influence on women's contraceptive behaviour resulting reduction in fertility. Policies and development processes that effectively reduce the existing disparities in the socio-economic conditions among various population groups should be adopted to reduce group differences in fertility.

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