Community Well-being and Infant Mortality in a Demographically Backward State in India

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Introduction

The community where a child is born is important for childhood growth and survival particularly in the Indian scenario. This notion comes from the fact that many communities in the country shared common amenities, such as, sanitation and drainage, source of drinking water, educational and health facilities and even toilet facilities in few instances. Community well being is one of the crucial factors which can encourage to have better basic amenities in the community and as such have strong bearing on infant mortality. Madhya Pradesh is one of the economically backward eastern states of India (Deolalikar, 2005) and infant mortality is a health outcome which is closely link with community's success in providing its newest and most vulnerable members with basic nutrition and healthcare (Finch, Frank & Hummer, 2000). Infant mortality is very high in Madhya Pradesh as compared to other states. According to the results of series of National Family Health Surveys (NFHS), NFHS-I(1992-93), NFHS-II(1998-99) and NFHS-III(2005-06), infant mortality rates in Madhya Pradesh from these surveys are 112, 81 and 64.7 per 1000 live births respectively and corresponding figures for all India are 79, 68 and 57 per 1000 live births. It is evident that over the years infant mortality rates in Madhya Pradesh has decline appreciably but the pace of decline lags behind the national rate of decline which further lags behind the global trend. For the world as whole IMR were 57 per 1000 live births during 2000-2005 as against 157 during 1950-55, registering a reduction of 100 points in a span of about 50 years.

To reduce the present national level of infant mortality rate by two-third by 2015 is one of the agendas of Millennium Development Goals (MDG) and for Madhya Pradesh reduction to 41 is under the purview of national MDG (Deolalikar, 2005). To draw feasible intervention programmes to enhance further reduction in infant mortality rate in Madhya Pradesh it is most important to understand the magnitude and direction of community, socio economic and demographic factors that are affecting IMR in Madhya Pradesh.

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Children born to literate women are found to have higher chances of surviving infanthood than of non-literate women. The other women backgrounds which are usually found to support survival of infanthood are household well being, urban resident, number of preceding children she had given birth, working outside the household, preceding birth interval, sex of the child etc. , besides other child care factors. Studies which support one or the other these propositions are found in Whitworth & Stephenson (2002), Kishore (1993), Jatrana (2004), Pebley et al. (1996), Sear et al. (2002), Das Gupta (1990), Basu & Basu (1991), Pradhan (2003) and Tarai (2007). There are also studies which emphasizes on community level backgrounds, such as, education (Kravdal, 2004; Ladusingh & Singh, 2006), poor community water and sanitation (Sastry, 1996), family and community (Bolstad & Manda, 2001), proximity to urban centers and distance to coast (Balk et al., 2004).

This paper proposed to study the effect of community well being on infant mortality in the context of Madhya Pradesh. Human beings are considered as social animals as their food habit, child and health care practices, way of life and socio-cultural practices are framed by the community to which they belong. Many a times individual factors which may vary from individual to individual are overshadowed by community background and keeping this in view we felt it important to incorporate community background along with other individual factors in this study of infant mortality in the economically backward state of Madhya Pradesh.

Community well being and Infant mortality

In underdeveloped societies, community well being plays a crucial role not only for moulding the economic prosperities of individuals but also is vital for diffusion and sharing of knowledge for the progress of the society itself. For in such society economic being can bring about a favourable change in social norms of early marriage, early child bearing, discrimination towards female child, considering household chores as women's responsibility, considering women value in terms of their reproductive potential only and stigmatization of women going outside home for education. It is also expected that economically forward community would make collective arrangement for making provision for education and healthcare facilities, besides keeping potable water and drainage for the community. All of the foregoing factors associated with community well being are expected to have strong bearing on ensuring survival of new born in the community. We have conceptualized this discussion on the link between community well being, associated intermediate factors and infant mortality in figure 1.

In the proposed conceptual framework we have three broad intermediate factors, namely, household standard of living by community well being. Household standard of living in turn to a large extend shape demographic factors, such as, total children ever born, age at birth of first child and partly sex of the new born in the present age of technology and also re-mould socio-economic background of women, including education, working status and individual economic condition. Besides, the demographic and socio-economic intermediate factors mutually controlling each other would collectively have strong bearing on infant mortality.

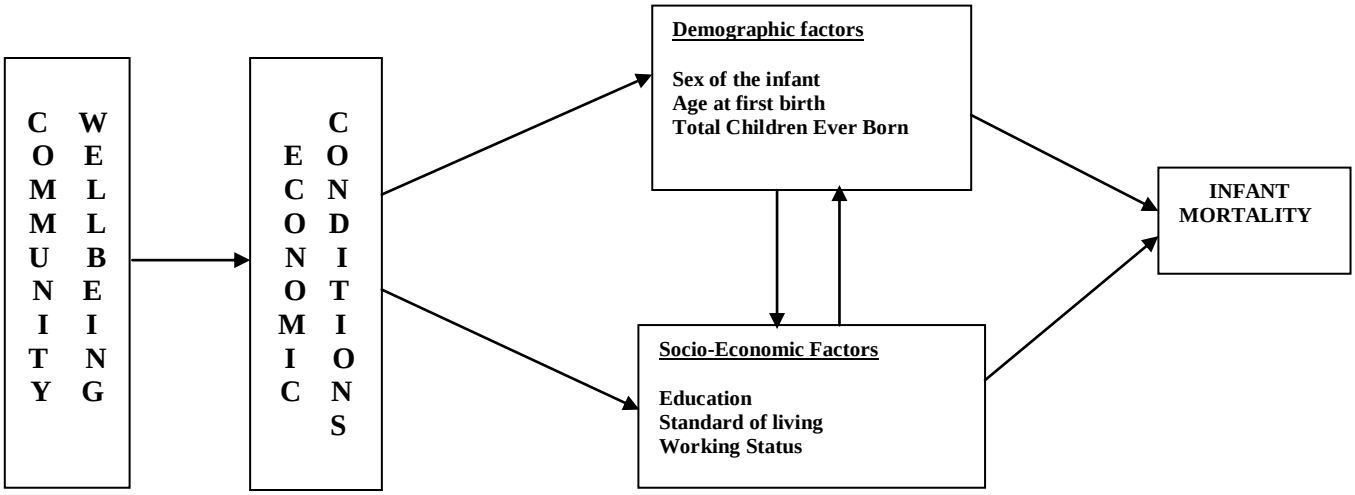

Figure 1: Conceptual framework showing the linkage between community well being, intermediate factors and infant mortality.

Review of Literature

Butz, Davanzo and Habitch (1982) studied biological and behavioral influences on the mortality of Malaysian infants. They found the influence of breast feeding on infant mortality. Mosley and Chen (1984) proposed a framework for studying determinants of child survival in developing countries, which considered the five proximate determinants, namely, maternal factors (age, parity, birth interval), environmental contamination (air, food, water), nutrient deficiency; injury(accidental, intentional) and personal illness. Gandotra and Das (1984) studied the levels and trends, correlates, causes and interrelationship between infant mortality and fertility. Along with other factors they found that inadequate supply of safe drinking water, unsatisfactory

housing conditions, poor environmental sanitation, poor nutrition and low level of medical facilities are some other factors responsible for high infant mortality in the country. In the study by Das Gupta (1990) on the determinants of child mortality in rural Punjab, she found the existence of death clustering in child mortality. Ashraf (1990) have studied infant mortality in rural India and found that socio-economic, demographic and risk factors effecting infant mortality. Basu and Basu (1991) have provided evidence that women's work, inspite of its other benefits has one crucial adverse consequence-a higher level of child mortality than amongst women who do not undertake heavy agricultural work. Martin and Njogu (1994) have done a multivariate decomposition analysis on a decade of change in contraceptive behaviour in Latin America. Sastry (1996) studied the differential in child survival between the North East and South East of Brazil in poor community and he studied the water supply, sanitation and health facilities in the community and he found that child mortality is affected by community level of education. Pebley, Goldman, Rodriguez (1996) studied on prenatal and delivery care and child hood immunization relating to family and community matter. Shajy (1999) has done a comparative study in infant mortality between Kerala and Madhya Pradesh on the basis of socio-economic and demographic factors and found that short spaced births an particular, seems to have determined a low survival to the children. Finch, Frank and Hummer (2000) studied the role of behavioral factors on racial ethnic disparities infant mortality. Bolstad and Manda (2001) studied the sociological and biological factors affecting infant mortality. They found that the variation in child mortality is largely due to family and community effect. Whitworth and Stephenson (2002) studied association of birth spacing, sibling rivalry and child mortality in India. They found that the likelihood of child mortality is higher for children with a good number of siblings. Dwivedi (2002) has done a multivariate decomposition of covariates of contraceptive use in Uttar Pradesh. Pradhan (2003) found low birth weight and premature delivery as the determinant factors of child mortality in Madhya Pradesh. Rao, Ladusingh and Paramjit (2004) found that giving food supplementation in the right time is important for child's nutrition and childhood survival in north east India. Jatrana (2004) studied the effect of socio-cultural practices on infant mortality in rural north India and found that colostrums is an important nutrient for child survival and survival chances of children of women who did not squeeze out breast milk in first time feeding is more . Balk et al. (2004) have studied spatial variation in child mortality in ten countries in West Africa and comes up with findings suggesting that places closer to coastal areas and urban centers negates child survival. Ladusingh and Singh (2006) have found significant positive effect of community education on child mortality in north eastern India. It is

found that there is no significant difference between sexes in case of child mortality. The study unfold that community education effect is more than maternal factors on child mortality.

Need for the study

Though infant mortality in Madhya Pradesh is one of the highest in the country there is dearth of study which integrate community background in conceptualization and in the right perspectives. Most of the existing studies give overemphasis on maternal background and child related factors. As any intervention programme aims towards providing cushion to child survival can't be individual oriented, there seems not much relevance of the findings of the existing studies of infant mortality in Madhya Pradesh. We have no idea on how community well being and inequality in living standard effect infant mortality.

Taking the aforesaid discussion and also consideration the fact that intervention programmes for ensuring child survival are targeted towards the community at large and also recognizing that there are a large population of different castes and tribes who are identified by distinct community characteristics, we strongly felt the need for looking into the contribution of community level factors on infant mortality, particularly for the state of Madhya Pradesh. This study shall not only fill the gap in research at least in the context of Madhya Pradesh but also provide a vital direction for policy formulation and implementation.

We are also not aware of any study which was design to test significance of community factors on infant mortality. In most of the available studies social groups are usually considered in place of community factors and this is not the ideal way of dealing community background.

Objectives

1. To study the effect of community well being on infant mortality over time, NFHS-II & NFHS-III.
2. To decompose change in infant mortality over time and examine contributions of rates and compositional changes.

Hypotheses

1. Community well being has no association with the incidence of infant mortality.
2. Inequality in community well being do not have any effect on incidence of infant mortality.

Data and Methodology

This study uses unit level data from NFHS-II (1998-99) and NFHS-III (2005-06). Details are available in IIPS-ORC Macro (2000, 2007).

For constructing community well being household standard of living for both NFHS – II & III are computed considering the same set of assets and the same set of weights for corresponding assets. Community well being is then taken as the mean of households within the same primary sampling unit (PSU), while inequality in community well being is operationalized as the coefficient of variation of SLIs of household in the same PSU. For PSU percentage of households which belong to SC, ST and OBC are computed and included in the analysis.

The response variable is the incidence infant mortality to children born in the last five years and is coded as 1 for infant death and 0 otherwise. Caste, working status, place of residence, educational attainment and total children ever born are the covariates considered in this study. Descriptions of these covariates are in table 1.

Methodology:

1. Univariate analysis is applied to ascertain the frequency of the covariates.
2. Bivariate analysis is applied to obtain the percentage distribution of covariates according to the status of infant mortality.
3. For multivariate analysis we have used logistic regression.

A multivariate decomposition analysis by (Martin and Njogu, 1994) is used to study the composition rates and interaction of covariates. The decomposition procedure applied in this study is based on the logit models estimated for the two surveys. The difference $\ln(p/1-p)_{(ii)} - \ln(p/1-p)_{(iii)}$ is decomposed as follows:

$$\text{logit}(NFHS_2)-\text{logit}(NFHS_3)$$
$$= (\beta 0_2-\beta 0_3) + \sum Pij_3\,(\beta ij_2 - \beta ij_3) + \sum \beta ij_3\,(Pij_2 - Pij_3) + \sum (Pij_2 - Pij_3)\,(\beta ij_2 - \beta ij_3)$$

Where Pij_2 is the proportion of jth category in ith covariate in NFHS-II.

Pij_3 is the proportion of jth category in the ith covariate in NFHS-III.

Bij_2 is the coefficient of jth category of the ith covariate in NFHS-II.

Bij_3 is the coefficient of jth category of the ith covariate in NFHS-III.

$B0_2$ is the regression constant of NFHS-II.

$B0_3$ is the regression constant of NFHS-III.

Results

Results of bivariate analysis are shown in table 2 for both NFHS- II (1998-99) and NFHS- III (2005-06). For both the period the incidence of infant mortality among ST/SC/OBC in Madhya Pradesh have remain more or less same at about 11.5 percent of children died in the five years periods preceding the surveys, though there is decline for general and others from 11 to 8.5 percents. Infant mortality cases among male infants have decline from 11.7 to 10.8 percents while the corresponding decline among female infants is from 10.4 to 10.2 percents and marginally more female infants survived than male infants and the scenario do not change. When the level of education increases, the incidence of infant mortality decreases, because an educated mother can take proper care of her health and her child. The results for NFHS-II indicates that infant mortality in case of uneducated women is more (13.0%) as compared to the women who have taken primary education (10.2%) and infant mortality is more in case of women who have got primary education as compared to women who have got secondary education (6.3%) and infant mortality are lesser for women who have got higher education (2.6%) as compared to the women who have got secondary education. For the corresponding levels of educational attainment of women the figures of infant deaths are 13, 9.7, 6.5 and 1 percents respectively showing sign of decline in the incidence of infant deaths in NHS-III by educational attainment. Infant mortality in NFHS-II are more for mother is under 18 years at the time of first birth (12.8%) as compared to women of age at first birth18-30 years (9.9%) and infant mortality decrease when women's age at first birth crosses 31 years (7.9%). In Madhya Pradesh unadjusted infant mortality in NFHS-II are more among the working women (12.2%) as compared to non working women (10.65%), because most of the women are engaged in agricultural related occupation. NFHS-III has witnessed marginal decline in infant mortality among non-working (9.3%), while for working women it has not change (12.4%). Infant mortality in both NFHS-II and NFHS-III is more in case of birth interval less than 12 months as compared to first birth and birth intervals more than 12 months. Also infant mortality in NFHS-II are less (9.5%) among the urban residents as compared to rural counterparts (11.5%) may be due to availability of health facilities, good source of drinking water, better toilet facility, electricity etc. The corresponding infant mortality figures for rural and urban areas in NFHS-III are 7.8% and 11.5% respectively, much improvement for urban residents but not so for rural residents.

Further we have observed that in case of caste, for SC, ST and OBC there is 0 .1% change from NFHS-II to NFHS-III. While for general and others caste category there is a decrease of 1.5% in the incidence of infant mortality. So it can be inferred that development factors provide more benefit to general and others than to ST, SC and OBC categories. Male infant death has decreased by 0.9% from NFHS-II to NFHS-III and female infant death decreased by0 .2%.There is no change in the percentage in infant deaths for the women who are not educated. Infant death has decreased by 0.5% from NFHS-II to NFHS-III incase of women who have completed primary education, it is almost same incase of women who have completed secondary education and 1.8% decrease for women who have completed higher education. Percentage of infant death is decreased by 3.6% from NFHS-II to NFHS-III, incase of women who are not working, infant death is remained same in both the time periods. There is a decrease of 1.7% infant deaths for urban areas from NFHS-II to NFHS-III and in rural areas it is same for both the timeperiods.

Result of multivariate analysis

The results of multivariate analysis are shown in table 3 in terms of odds ratios of infant death for specified categories of covariates in comparison to specified categories for the respective covariates included in this study. Most interesting findings are related to the two hypotheses set up for testing in this study. Interestingly both for NFHS-II and NHS-III we found that higher the level of community the lesser is the likelihood of infant death but the relationship has weaken over time as the association is found to be significant only in NFHS-II. The plausible explanation is that with development and modernization community ties might be also weakening. Finding related to the second hypothesis is that the more is the inequality in community well being the lesser is the likelihood of infant deaths. This positive association between inequality in community well being and survival chance of infants is statistically significant both for NFHS-II and NFHS-III. This can be due to the fact that in communities where both poor and non-poor households live together there is always mutual benefit in terms of sharing knowledge and facilities. In NFHS-II we observed no differential in infant mortality by caste. It is also noted that female infants are 13.6% less likely to experience infant deaths as compared to male infants and this differential at 5% level of significance. As regards differential by educational attainment of women, infants born to women who have completed primary education are 20.3% less likely to face infant deaths as compared to women who are not educated and this is significant at 5% level of significance. For infants born to women who are educated upto secondary level the odds infant death is 46.1% lesser as compared to the women who are not educated and is significant

at 1% level of significance. The women who have completed their higher education are 66.9% less likely in infant mortality as compared to the women who are not educated. For an increase by one child in total children ever born, the odds of infant death increases by 87.2% and this increase is statistically significant at 1%. If preceding birth interval is less than 12 months then the odds of infant death increased by 78.4% as compared to first birth at 1% level of significance. If preceding birth interval is between 12 to 18 months then odds of infant death increases by 18.7% and it decreases by 47.4% if preceding birth interval is more than 18 months and this is significant at 1% level of significance. Work status has no significant effect on infant mortality. One point increase in the percentage of SC/ST/OBC population in the community leads decline in the odds of infant death by .4% at 5% level of significance. Also place of residence and age at first birth are not statistically significant on infant mortality.

As regards some of the relationships in NFHS-III, caste and sex of the child have no significant effect on infant mortality. When it comes to adjusted association between infant mortality and educational attainment of women and preceding birth interval, we have found similar results and significance as in NFHS-II with slight improvement in the values of odds of infant mortality. The women's working status is not statistically significant on infant mortality. Infants of rural areas the odds of facing infant deaths is 24.7% higher as compared infants in urban areas and is significant at 5% level of significance. Age at first birth has no significant effect on infant mortality. As the regards the controlled association between children ever born we found similar results for NFHS-III. Unlike as in NFHS-II, we found that one point increase in the percentage of SC/ST/OBC population in the community, the odds of infant death increase marginally but is not found to be statistically significant.

Results of decomposition analysis

The results of decomposition analysis are shown in table 4 in terms of magnitude and directions of change associated with the covariates included in the study - sex of the infant, education of mother, age at the time of birth and place of residence, preceding birth interval, caste, working status and community wellbeing. The change in the direction in the rates shows a declining trend among different subgroups with respect to the reference category. From table 4 we find that the direction of rate in community wellbeing and inequality in community wellbeing is negative. It shows that infant mortality decreases with the increase of community wellbeing and if the inequality in community wellbeing is more then infant mortality decreases. In case of sex of

infant, working status, place of residence, the direction of rate is negative i.e. infant mortality experienced by female is less than male, Infant mortality in case of working women is less as compared to non working women, infant mortality in rural areas is less as compared to urban areas. While rate and composition in a population decreases then infant mortality also decreases. Change in the composition referred to structural change in the population of Madhya Pradesh like increase in percentage of urban population, increase in percentage of female education and increase in the percentage of working women. Compositional change explains the increase in infant mortality in Madhya Pradesh. Interaction is the joint effect of rates and composition.

Summary and conclusion

The study shows that there is an effect of community well being on infant mortality for both the time periods, NFHS-II and NFHS-III in Madhya Pradesh. Though infant mortality rate has declined over time still it is high as compared to the national level. During the period 1998-1999 to 2005-2006 there is a decrease of just 0.6 percent in infant mortality. The study also shows that infant mortality decreases with increase in community well being and inequality in community well being is found to have unfavourable influence on infant mortality. Educational attainment of women has negative association with infant mortality. Total number of children ever born has a positive association with infant mortality. Working status is also positively associated with infant mortality, because in rural areas most of the women are engaged in agriculture related works. Apart from this demographic and economic factors variation in household standard of living have also negative association with infant mortality. So policy makers should emphasize intervention strategies for underdeveloped communities ensuring infant survival in Madhya Pradesh. This consideration is crucial more so in the context of Madhya Pradesh as survival of an infant also depend upon the community environment and living conditions.

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Table 1: Definition and Classification of Variables used in the analysis

Variables	Response Categories	Description of variables
Coefficient of variation in SLI	PSU level measurement	Coefficient of variation in SLI for each psu is computed.
Mean SLI	PSU level measurement	Mean of SLI for each psu is computed.
Caste	SC,ST,OBC General & Others	Cast of the women at the time of survey
Sex	Male Female	Sex of the baby
Education	No education Primary Secondary Higher	Educational qualification of the respondent at the time of survey
Preceding birth interval	0 <12 12-18 18+ months	Preceding birth interval
Working Status	Not Working Working	Working status of the women whether she in working in any sector or not.
Place of residence	Urban Rural	Place of residence of the respondent
Age at first birth	< 18 18-30 31-42	Age of the women at first birth
Total children ever born	1 2 3+	Total number of children of the women at the time of survey

Table 2: Percentage of Infant survival and death in Madhya Pradesh by socio-economic backgrounds

Background characteristics	NFHS-II Response variable			NFHS-III Response variable		
	Infant survival	Infant death	N	Infant survival	Infant death	N
Caste						
SC/ST/OBC	**88.5**	**11.5**	**8868**	**88.6**	**11.4**	**6284**
others	**90.0**	**10.0**	**3658**	**91.5**	**8.5**	**2816**
Sex of infant						
Male	**88.3**	**11.7**	**6494**	**89.2**	**10.8**	**4799**
Female	**89.6**	**10.4**	**6035**	**89.8**	**10.2**	**4301**
Education						
no education	**87.0**	**13.0**	**7465**	**87.0**	**13.0**	**4757**
primary	**89.8**	**10.2**	**2692**	**90.3**	**9.7**	**2012**
secondary	**93.7**	**6.3**	**2089**	**93.5**	**6.5**	**2124**
higher	**97.2**	**2.8**	**283**	**99.0**	**1.0**	**207**
Preceding birth interval						
0	**87.8**	**12.2**	**3965**	**87.9**	**12.1**	**3121**
<12	**74.9**	**25.1**	**331**	**78.1**	**21.9**	**288**
12-18	**81.9**	**18.1**	**1098**	**82.7**	**17.3**	**727**
18+	**91.3**	**8.7**	**7135**	**92.2**	**7.8**	**4964**
Working status						
Not working	**89.4**	**10.6**	**8670**	**90.7**	**9.3**	**5457**
Working	**87.8**	**12.2**	**3859**	**87.7**	**12.3**	**3643**
Place of residence						
Urban	**90.5**	**9.5**	**2454**	**92.2**	**7.8**	**2475**
Rural	**88.5**	**11.5**	**10075**	**88.5**	**11.5**	**6625**
Age at first birth						
<18	**87.2**	**12.8**	**5204**	**87.4**	**12.6**	**3259**
18-30	**90.1**	**9.9**	**7287**	**90.6**	**9.4**	**5806**
31-42	**92.1**	**7.9**	**38**	**97.1**	**2.9**	**35**
Total children ever born						
1	**93.9**	**6.1**	**665**	**95.0**	**5.0**	**598**
2	**94.5**	**5.5**	**1936**	**95.1**	**4.9**	**1718**
3+	**87.5**	**12.5**	**9938**	**87.6**	**12.4**	**6784**
Total	**88.9**	**11.1**	**12529**	**89.5**	**10.5**	**9100**

Table 3: Estimated odds ratio of infant mortality in Madhya Pradesh for NFHS-II (1998-1999) and NFHS-III (2005-2006)

Independent Variables	NFHS-II			NFHS-III		
	β	Standard error	exp(β)	β	Standard error	exp(β)
Coefficient of Variation(SLI)	**-0.004**	**0.002**	**0.996***	**-0.003**	**0.001**	**0.997***
Mean(SLI)	**-0.022**	**0.006**	**0.979****	**-0.002**	**0.003**	**0.998**
Percentage of SC/ST/OBC	**-0.005**	**0.002**	**0.995***	**0.002**	**0.002**	**1.002**
Caste						
SC/ST/OBC®						
General & Others	**-0.050**	**0.079**	**0.951**	**-0.074**	**0.101**	**0.928**
Sex of Infant						
Male®						
Female	**-0.146**	**0.058**	**0.864***	**-0.113**	**0.07**	**0.893**
Education						
No education®						
Primary	**-0.226**	**0.077**	**0.797***	**-0.246**	**0.093**	**0.782***
Secondary	**-0.618**	**0.106**	**0.539****	**-0.473**	**0.111**	**0.623****
Higher	**-1.106**	**0.372**	**0.331***	**-1.944**	**0.721**	**0.143***
Preceding birth interval						
0®						
<12	**0.579**	**0.139**	**1.784****	**0.281**	**0.156**	**1.324**
12-18	**0.171**	**0.095**	**1.187**	**0.053**	**0.116**	**1.055**
18+	**-0.643**	**0.067**	**0.526****	**-0.848**	**0.08**	**0.428****
Work Status						
Not Working®						
Working	**0.019**	**0.066**	**1.019**	**0.024**	**0.079**	**1.024**
Place of Residence						
Urban®						
Rural	**0.042**	**0.083**	**1.042**	**0.22**	**0.091**	**1.247***
Age at First Birth						
<18®						
18-30	**-0.110**	**0.061**	**0.896**	**-0.124**	**0.073**	**0.883**
31-42	**0.130**	**0.621**	**1.138**	**-0.784**	**1.033**	**0.456**
Total children ever born	**0.627**	**0.074**	**1.872****	**0.741**	**0.087**	**2.098****
Constant	**-2.487**	**0.298**	**0.083**	**-3.606**	**0.299**	**0.027**

Note: ** P<0.01 and * p<0.05

Table 4: Decomposition of Change in Infant Mortality, Madhya Pradesh, 1998-99 & 2005-06

Variables	Rates	Composition	Interaction
Coefficient of variation (SLI)	**-0.0007**	**1.1194**	**0.0001**
Mean (SLI)	**-0.0141**	**1.1192**	**0.0018**
Caste	**0.0020**	**1.1179**	**0.0004**
Sex of infant	**-0.0034**	**1.1188**	**-0.0001**
Education	**0.0009**	**1.0837**	**0.0155**
Preceding birth interval	**0.1017**	**1.1208**	**0.0123**
Working status	**-0.0006**	**1.1190**	**0.0000**
Place of residence	**-0.0205**	**1.1190**	**0.0000**
Age at first birth	**0.0278**	**1.0792**	**0.0458**
Total	**0.0932**	**9.9969**	**0.0757**