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THE CORRELATION OF INFANT MORTALITY RATE AND SEX RATIOS IN INDIAN STATES.

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ABSTRACT

Background: Infant mortality rate and sex ratio are invaluable health and socioeconomic indicators. There have been considerable gains in both indices. However the gains are not uniform and consistent. ***Aims:*** To determine if the change in infant mortality rate has positively influenced the sex ratio and to study the regional variations of these parameters. ***Materials and Methods:*** Sex ratio and infant mortality rate data from the past 4 censuses from 1981 to 2011 on 24 states were collated and analyzed. ***Results:*** There is a significant regional variation among the states and ranges from a sex ratio of 1084 for Kerala and 868 for Delhi. The infant mortality rate ranges from 11 for Goa and Manipur and 59 for Madhya Pradesh. States which have a low IMR do not necessarily have a better balanced sex ratio. ***Conclusion:*** There is significant regional variation in these parameters and the gains of a falling IMR are not equitably distributed.

INTRODUCTION

In a vast country like India, there is a significant degree of regional variation in vital population indices such as Infant Mortality Rate (IMR) and Sex Ratio. Infant mortality rate is defined as number of infant deaths per 1,000 live births[1]. Sex ratio denotes the number of females per 1000 male population[2]. Various factors have a bearing on these indices. Conservative gender bias resulting in son preference is one of the biggest determinants influencing both IMR and Sex Ratios. Practices like female feticide and female infanticide and health care preference for male children contributes to the imbalance in the sex ratio[3]. Considerable strides in quality healthcare, wider reach, improvement in technology and rise in literacy rates has resulted in a dramatic fall in IMR in many states, but these gains have been uneven and unfortunately these benefits have sometimes been gender specific. Projection based on population dynamics revealed that a sex ratio at birth of 106 males per 100 females, coupled with differences in mortality resulted in an imbalanced sex ratio[4]. A regional analysis revealed that sex selective abortion and excess post natal mortality between 1950 and 2010 resulted in 58 million 'missing' women[5]. The purpose of this study is to assess whether the improvement in IMR are equitably distributed among both genders and to study the regional variation in these vital indices.

MATERIALS AND METHODS

Data on the infant mortality rates of 24 Indian states were collected from the census reports of the 1981[6], 1991, 2001[7] and 2011[8] censuses. Law and order problems and an insurgency lead to the census not being conducted in Assam in 1981 and Punjab in 1991.Hence these 2 states were not included in our study. Although parts of Uttar Pradesh, Madhya Pradesh and Bihar were partitioned to form three smaller states in 2000, data on these states was included because the massive size of these states made them difficult to ignore, however consequently there may be a marginal degree of error in their results. Similar data on the sex ratios for the same states were included from the 1981, 1991, 2001[9] and 2011[10] censuses. The data obtained was analyzed and the changes in both the sex ratio, and infant mortality rates for each consecutive census were determined.

RESULTS

Data on the IMR and the decadal change in IMR is featured in Table 1; the state with the least IMR in 1981 was Manipur (28). In 2011 Goa and Manipur had the least IMR (11). The IMR in Madhya Pradesh in 1981 was 133 and 59 in 2011. This was the highest IMR for an individual state in both the censuses. The IMR in India in 1981 was 77, three decades later the IMR had fallen to 44.

The Sex ratio in India in 1981 was 934, dipped to 927 in 1991, recovered to a figure of 933 in 2001 and improved to 943 in 2011, a gain of 9 in 30 years. The see sawing of the sex ratio was reflected in the figures for many individual states as shown in Table 2. Kerala had a sex ratio of 1032 in 1981 which improved further to 1084 in 2011. Delhi had a highly masculine ratio 808 in 1981 and 868 in 2011 this was the worst female to male ratio among the states. Between 1981 and 1991 the sex ratio declined in 15 states and the IMR increased in 4 states. In

the next decade 8 states showed a decline in the sex ratio and all states showed improvement in the IMR. Between 2001 and 2011, 2 states showed a decline in the sex ratio and only Haryana showed an increase in IMR.

Table 1: Infant mortality Rate in Indian states 1981-2011

States	Infant Mortality Rate (IMR)				Change in IMR		
	1981	**1991**	**2001**	**2011**	**81-91**	**91-01**	**01-11**
	a	b	c	d	(b-a)	(c-b)	(d-c)
Andhra Pradesh	55	49	43	43	06	06	00
Arunachal Pradesh	91	83	61	32	08	22	29
Bihar	75	70	57	44	05	13	13
Delhi	54	49	40	28	05	09	12
Goa	51	34	28	11	17	06	17
Gujarat	78	69	59	41	09	10	18
Haryana	52	55	40	44	-03	15	-04
Himachal Pradesh	82	75	45	38	07	30	07
Karnataka	74	60	54	35	14	06	19
Kerala	42	37	18	12	05	19	06
Madhya Pradesh	133	107	94	59	26	13	35
Maharashtra	74	58	49	25	16	09	24
Manipur	28	36	31	11	-08	05	20
Meghalaya	80	76	58	52	04	18	06
Mizoram	53	58	41	34	-05	17	07
Nagaland	51	55	39	21	04	16	18
Orissa	125	108	90	57	17	18	33
Punjab	74	54	43	30	20	11	13
Rajasthan	87	81	79	52	06	02	27
Sikkim	60	57	43	26	03	14	17
Tamil Nadu	54	53	44	22	01	09	22
Tripura	82	78	64	29	04	14	35
Uttar Pradesh	99	89	84	57	10	05	27
West Bengal	62	67	59	32	-05	08	27
India	77	74	54	44	03	20	10

Table 2: Sex Ratio in Indian states 1981-2011

States	Sex Ratio				Change in Sex Ratio		
	1981	**1991**	**2001**	**2011**	**81-91**	**91-01**	**01-11**
	a	**b**	**c**	**d**	**(b-a)**	**(c-b)**	**(d-c)**
Andhra Pradesh	975	972	978	993	-03	06	15
Arunachal Pradesh	862	859	901	938	-03	42	37
Bihar	948	907	921	918	-41	14	-03
Delhi	808	827	821	868	19	-06	47
Goa	975	967	960	973	-08	-07	13
Gujarat	942	934	921	919	-08	-13	-02
Haryana	870	865	861	879	-05	-04	18
Himachal Pradesh	973	976	970	972	03	-06	02
Karnataka	963	960	964	973	-03	04	09
Kerala	1032	1036	1058	1084	04	22	26
Madhya Pradesh	921	912	920	931	-09	08	11
Maharashtra	937	934	922	929	-03	-12	07
Manipur	971	958	978	992	-13	20	14
Meghalaya	954	955	975	989	01	20	14
Mizoram	919	921	938	976	02	17	38
Nagaland	863	886	909	931	23	23	22
Orissa	981	971	972	979	-10	01	07
Punjab	879	882	874	895	03	-08	21
Rajasthan	919	910	922	928	-09	12	06
Sikkim	835	878	875	890	43	-03	15
Tamil Nadu	977	974	986	996	-03	12	10
Tripura	946	945	950	960	-01	05	10
Uttar Pradesh	882	876	898	912	-06	22	14
West Bengal	911	917	934	950	06	17	16
India	934	927	933	943	-07	06	10

Figure 1 shows the correlation of IMR and Sex Ratio in the southern states. The stellar performance of Kerala and Tamil Nadu is demonstrated here. The only state with more females than males is Kerala. The figures for India as a whole are also included to serve as a comparison tool and all the states in the south show much better progress and stats when compared to the figures for the entire country.

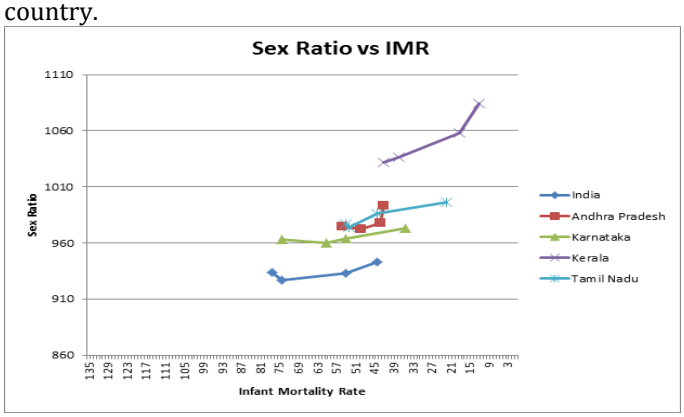

Figure 1: Sex Ratio vs IMR- South Indian States

Figure 2 shows the correlation of IMR and Sex Ratio in the Northern states. The best performer by far in the North is Himachal Pradesh and the gains achieved, in terms of achieving gender balance in Himachal Pradesh is clearly demonstrated here and is the only state that consistently outperforms the country wide figures.

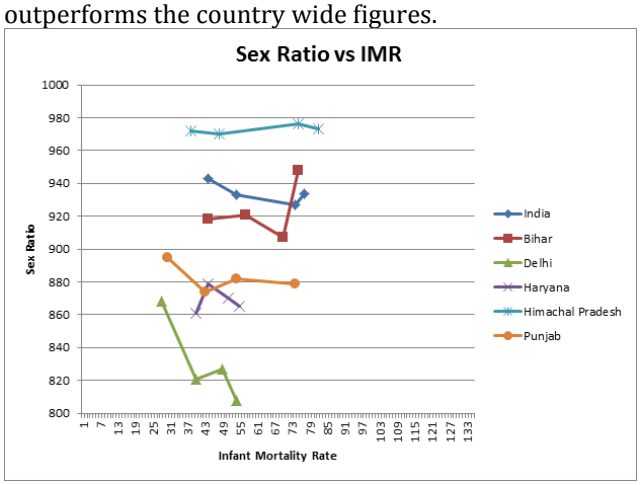

Figure 2: Sex Ratio vs IMR- North Indian States

Figure 3 shows the correlation of IMR and Sex Ratio in states in West and Central India. The best gender balance here is demonstrated by Goa and Orissa. Orissa's IMR however is higher than the other states.

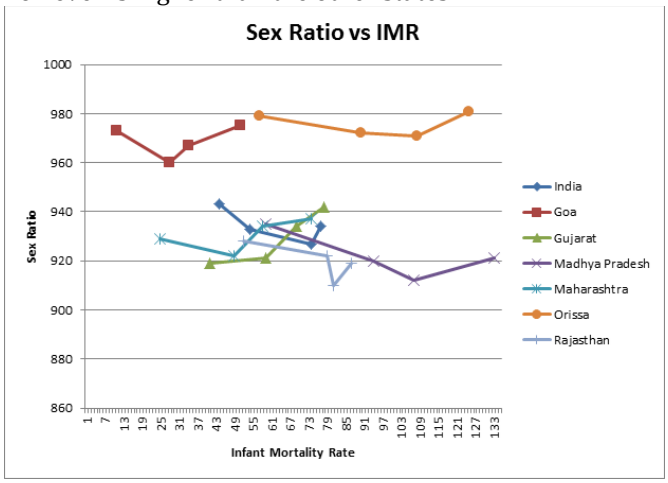

Figure 3: Sex Ratio vs IMR- Western & Central Indian States

Figure 4 shows the correlation of IMR and Sex Ratio in Eastern Indian states. Manipur is clearly by far the best performer, both in terms of IMR and sex ratio in the entire region.

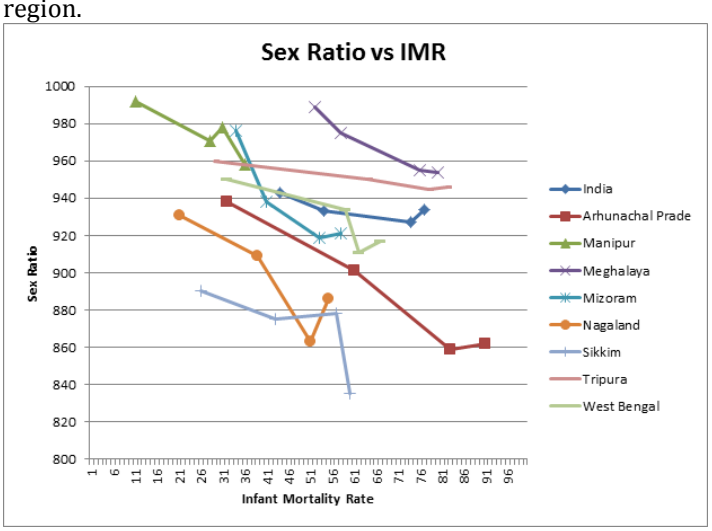

Figure 4: Sex Ratio vs IMR- Eastern Indian States

DISCUSSION

Women's rights and the fight for gender equality in India have acquired prominence in the socioeconomic milieu, political space and mainstream media. Especially in the background of recent atrocities committed against women. There has also been significant progress in achieving gender equality. Female literacy and greater female participation in the labor force has resulted in empowering and enhancing the status of women. Our study reveals that the number of states showing negative movement on the sex ratio parameters in the decadal census reports have reduced in successive censuses. The number of states showing a reduction in the sex ratio was 15, 8 and 2 in the preceding 3 censuses. This augurs well for gender balance. However as our study has shown, the improvement in the sex ratio has not matched the fall in IMR. The IMR has reduced at a faster pace when compared to the forward movement on gender balance. Delhi had an IMR of 28 in 2011, but the sex ratio for the same year was a woeful 868.

Technology which is at most times an enabling tool can sometimes be a double edged sword, ante natal sex determination has often resulted in gender selective abortions. Advancement and adoption of ante natal sex detection technology has resulted in a skewed sex ratio[11]. The increasing usage of pre natal sex determination tools and son preference has resulted in a highly masculine sex ratio[12].

There is also a significant degree of regional variation in the infant mortality rates and sex ratios. Generally states with higher levels of literacy, especially female literacy tend to do better on infant mortality parameters and gender balance. In our study figures 1-4 illustrate this argument. Data from the National Family Health Survey 2 was used to examine the social and demographic characteristics of women on the likelihood of abortion; Southern women had lower levels of son preference and smaller family size[13]. Conservative ideals, patriarchal societies and traditional dogma have hindered gender equality in the North. Women in the southern states are more likely to make use of health services and adopt innovative fertility control practices due to the higher degree of autonomy they enjoy[14]. It was estimated that more than 1,00,000 abortions of female fetuses were

done in India during the latter part of the 1990's, most of these abortions were performed in 3 states- Gujarat, Punjab and Haryana[15]. Even within the regions, there were some states which were laggards and some which outshone their peers, this interregional variation can again be appreciated in figures 1-4. In the Northern states the performance of Himachal Pradesh was commendable and should be a role model for other states in the region. Himachal Pradesh's efforts in reducing the sex ratio dramatically from 884 to 976 in nine decades, was even praised by the American Journal of Population Health[16].

The reasons for selective abortions are many and varied and are more prevalent in Asian countries. Son preference in Asia was attributed to the social disincentives in raising a daughter like dowry, perceived less earning capacity and patriarchal family hierarchy[17]. Gender discrimination is not just prevalent at birth but persists through childhood; in India child mortality for girls exceeds child mortality for boys by 43 percent[18]. A study published in the Quarterly Journal of Economics revealed that breast feeding is negatively correlated with future fertility, the study showed that breast feeding duration increased with birth order, is lowest for daughters and children without older brothers[19].Gender discrimination in terms of son preference, health, education and occupational choices are prevalent in large swathes of our country. Distressingly, even in management of illnesses and surgical procedures a bias is apparent. In an Indian tertiary care hospital, when pediatric cardiac surgery was advised in 405 children, parents consented in 77% of boys. But for girls parents consented in only 44% of the cases. This shows that gender was a major determinant in treatment choices and compliance[20].

CONCLUSIONS

Our study shows that in the past 3 decades there have been substantial gains in infant mortality and sex ratio parameters. But the benefits of a fall in IMR seem to have accrued more towards male infants. The sex ratio has improved too but has not been abreast with the change in IMR. There are obvious regional differences demonstrated in our study and generally a higher literacy rate helps immensely in positively impacting the sex ratio and infant mortality. Efforts to improve literacy, legal measures on ante natal sex determination and influencing societal perceptions of the status of women would help in securing tangible gains both in gender ratios and infant mortality rates and realizing an equitable community.

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