Consistency in estimates of sex ratio at birth from registered birth to census in Greater Mumbai

Introduction

The population sex ratio of most of the countries in the world is in favor of female population, with the exception of many countries of Southern and South-East Asia. The sex ratio in India has been historically in favor of men and adverse to women. Sen, (2003) estimated that 37 million women in India are missing. Sex ratio has been declining over the decades in the country as a whole and in most of the states. Over the past censuses, sex ratio has fallen drastically from 972 females per 1,000 males in 1901 to 930 in 1971. The ratio showed only a small increase from 930 in 1971 to 931 in 1981, but it further declined to 927 in 1991 and again showed an increasing trend from 927 in 1991 to 933 in 2001 (Census., 2001).

The overall sex ratio is the result of sex ratio at birth, sex differentials in mortality, sex selective migration and sex differentials in under enumeration. However, in India so far there is no evidence to point out at the significant contribution from sex differentials in migration. Until the recent decades, low sex ratio was primarily explained by higher female than male mortality (Visaria., 1969). The continued decline in overall sex ratio in spite of narrowing the gap between female-male mortality and a steep decline in child sex ratio seems to be due to an increasing sex ratio at birth. Sex ratio at birth is one of the initial conditions that determine the sex ratio of overall population.

It is well established that under normal circumstances more male than female babies are born among all human population throughout the world and that sex of the newborn with reliable data on births varies in the narrow range of 103 to 107 male births per 100 female

births (Waldran., 1980). However, since 1980's the increase in the sex ratio at birth has been evidenced in many Asian countries. It was first made visible by census results in China (1990s and 2000) and in several Indian states (1991 and 2001 censuses, and fertility mortality surveys) as well as in South Korea. Recently some countries such as Georgia, Armenia and Azerbaijan have detected a trend in sex ratio at birth, where birth registration showed a rise in the masculinity of births over the course of the 2000-2006s. However, other continents in the world did not show much change in sex ratio at birth (Guilmoto et al., 2009).

Though, decline in sex ratio at birth has been evidenced, variations are not uniform throughout the world and within the country. The data available from Indian censuses have shown a significant decline in sex ratio at birth particularly in northern and western states of India. The large proportions of male children have become more prominent in states like Rajasthan, Punjab, Haryana, Gujarat and Maharashtra. The higher proportion of male children and its increasing trend is more observed in urban areas as compared to rural areas (Agnihotri., 2000). At all India level, decline in sex ratio at birth since 1980s may have been not more than 2 percent, in some part of northern and western India, the decline have been found of order 10 percent, which was much higher than that can be explained by the higher chance of females than males dying during infancy (Bhat., 2002). Therefore in order to balance the sex ratio several efforts have been made by the government of India. The PNDT Act (1995) was the comprehensive intervention made in this direction. But still there is an increase in sex ratio at birth in India.

The decline in the sex ratio at birth in the last two decades is attributed to the increasing incidence of sex selective abortions and female foeticide. The bias against female babies is because of the culture preference for sons. In patriarchal societies, couples prefer to

have male children because of greater social and economic values attached to male children. Son preference, leads to wide spread female discrimination (Tiziana et al. 2003). Consequently parents are likely to use all possible means to ensure the birth of at least one son.

According to Chang, 1994, "theoretically, in a society where each couple wants one son at least, and if each couple were willing to use prenatal sex detection and sex-selective abortion of female fetuses, then the effect of son preference on the sex ratio at birth would be greater at low fertility than high fertility".

In this context the present study has attempted to explore the phenomenon of sex ratio at birth in metropolitan city of Mumbai, which is part of Maharashtra-the state that has experienced higher and increasing sex ratio of child population.

Need for the Study:

In India, the research work has clearly brought out high proportion of male births and an increasing trend in sex ratio at birth. However most of the research on sex ratio at birth is based on census reporting of sex ratio of child population. In India, as the vital registration system is incomplete, there is no reliable statistics on sex ratio at birth at national and state level which is estimated directly on number of births. Surveys like NFHS and DLHS give evidence of higher sex ratio at birth, but they are based on smaller number of births and hence the estimates have very high sampling error.

From registration data one can estimate the sex ratio at birth, but in India birth registration is not complete. However some of the developed states of India have fairly reliable reporting of vital statistics and Maharashtra is one among them. Henceforth, the present study has been focused on Mumbai a metropolitan city of Maharashtra constituting

more than 1crore people of India. Literacy rate of 90 percent for males and 83 percent for women in Mumbai makes it a city of the literate and the informed. Being an urban area, extremely high proportion of births takes place in maternity hospitals (86% as per NFHS-3). As a result the registration of vital events is accurate up to 99 percent (Garfikel et al., 1976) in Mumbai. Therefore the conclusion drawn on the basis of these data can be considered reliable. Consequently the present study proposes to explore the phenomenon of sex ratio at birth using published data from Annual reports of the Public Health Department, Municipal Corporation of Greater Bombay during 1964-1990, and unpublished data from BMC for the period (1995-2008).

There is no denying the fact that the falling sex ratio at birth is definitely a matter of grave policy concern (Srinivasan., 1994; Bhat., 2002) and in order to take any policy step in this regard one should be aware of the quality of the data and also its magnitude in the past. Hence there is an urgent need to study the reality of the issue in a greater depth and come up with some policy implications utilizing the vital registration data of Mumbai.

Objectives:

Broadly, the present study attempts to understand the level and differentials in sex ratio at birth over the passage of time in Greater Mumbai. The specific objectives are

- ✓ To examine the consistency in estimates of sex ratio at birth from data on registered births by Bombay Municipal Corporation and estimates from census age distributions.
- ✓ To study the present level and past trends in sex ratio at birth in Greater Mumbai.

Data and Methodology:

The annual male and female live births were obtained directly from the Bombay Municipal Corporation. For the period 1960-94 the study utilizes published data from the reports of executive health officer, while for the later years it utilizes the data (unpublished) collected personally by the researcher from the Public Health Department of Brihan Mumbai Municipal Corporation. The data given by BMC was completely in raw format, therefore before calculating the sex ratio at birth filtration of the dbase files has been done. After that data is sorted by the variable gender in order to get the births by sex of the babies. The sex ratio at birth has been directly estimated by the following equation

$$\textit{Sex Ratio at Birth} = \frac{\textit{Total number of male births}}{\textit{Total number of female births}} * 100 \qquad \textbf{(i)}$$

In order to fulfill the first objective, apart from the Bombay Municipal Corporation data, Census data for the period 1961 to 2001 and NFHS-3 (2005-06) data has been used. Census gives information on age sex distribution of the population starting from 1881 to 2001 at country and state level, even within state at district level. Using this information sex ratio at birth has been calculated by Reverse Survival Technique. The computation procedure is as follows:

Let $P^t_{M(0-4)}$ and $P^t_{M(5-9)}$ represents male population in age group (0-4) and (5-9) at time point t. And ${}_5L_0^{t-5,t}$ ${}_5L_0^{t-10,t-5}$ life table values (Lx) for males at different time points say at t, t-5 and t-10, then

(i) Number of male births during five year period prior to survey

$$\mathbf{B^{t-5,t}_M = P^t_{0-4} * 5 * l_0 / {}_5L_0^{t-5,t}}$$

Similarly,

(ii) Number of male births during 5-10 years prior to survey

$$B^{t-10,t-5}{}_{M} = P^{t}{}_{5-9} * 5 * l_0 / {}_5L_5{}^{t-10,t-5}$$

The similar procedure has been applied to calculate the female births. After calculating the births separately for males and females sex ratio at birth has been directly estimated by the equation (i).

Findings:

(A) Consistency of the registration data in comparison to Census and NFHS-3 Survey data

Completeness of Registered births in Greater Mumbai:

We all are aware about the quality of the registration data in India, According to latest estimate SRS 2007, at national level only about 56 percent births has been registered (SRS, 2007). However some of the states in India have high registration level of vital events such as Birth, and Deaths. According to SRS 2007, in Maharashtra more than 80 births have been registered and among its all districts Bombay ranks at top in the level of registration.

As Bombay is a fully urbanized area, most of the deliveries take place in hospitals. Furthermore there exist a large number of municipal/government maternity hospitals whose services are free or require nominal charges. In Greater Bombay birth certificates are required for the purpose of school admission. Even during 1960s, about 85 percent of the total births in Greater Bombay are maternity hospitals (M. Badry., 1962). According to the latest statistics, 86 percent of the births in Mumbai are institutional births (NFHS-3).

According to NFHS-3, 90 percent births of the children of age 0-4 were registered in Mumbai and almost the same proportion of births has been observed in slum and non slum area (NFHS-3, Maharashtra Report).

In order to check the completeness of the birth registration, the estimates of birth rates obtained from the registered births are matched with SRS and NFHS-3 birth rates for urban Maharashtra and Mumbai. According to NFHS-3 CBR in urban areas of Maharashtra is 18.2 and that in Mumbai is 15.6. In other words the CBR in Mumbai is lower than CBR in Maharashtra by 15 percent. Applying the same ratio of Mumbai's CBR and urban Maharashtra's CBR to SRS birth rates for urban Maharashtra for all the years, CBRs for Mumbai are estimated indirectly. Estimates of CBR for Mumbai as estimated from registered number of births, derived indirectly from birth rates for urban Maharashtra and SRS birth rates for urban Maharashtra are plotted on the graph (figure 2.3). From figure it is seen that birth rates from registration data lies between birth rates from the other two sources, which shows that registration of births in Mumbai is fairly complete and reliable. Thus inferences drawn from this data are considered to be quite accurate.

Figure 2.3 Crude Birth Rates estimated from Different Sources, (1969-2008)

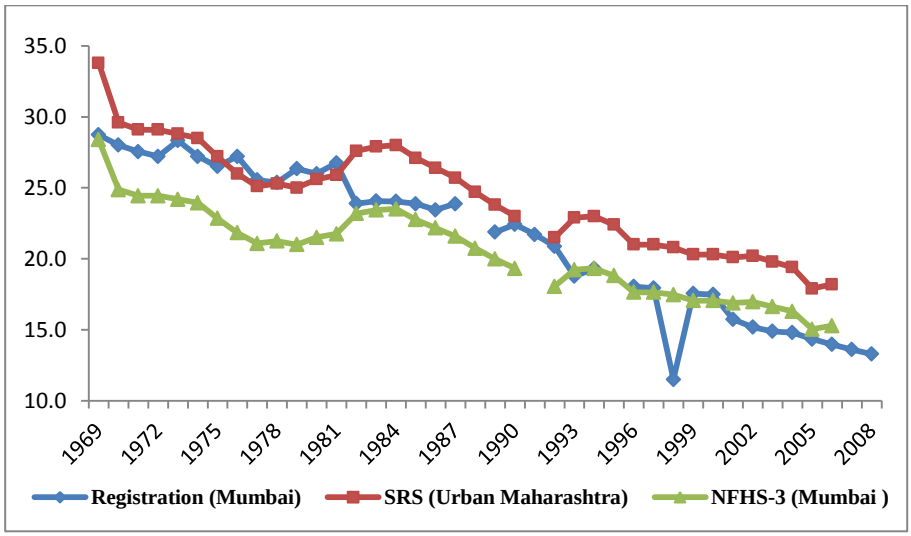
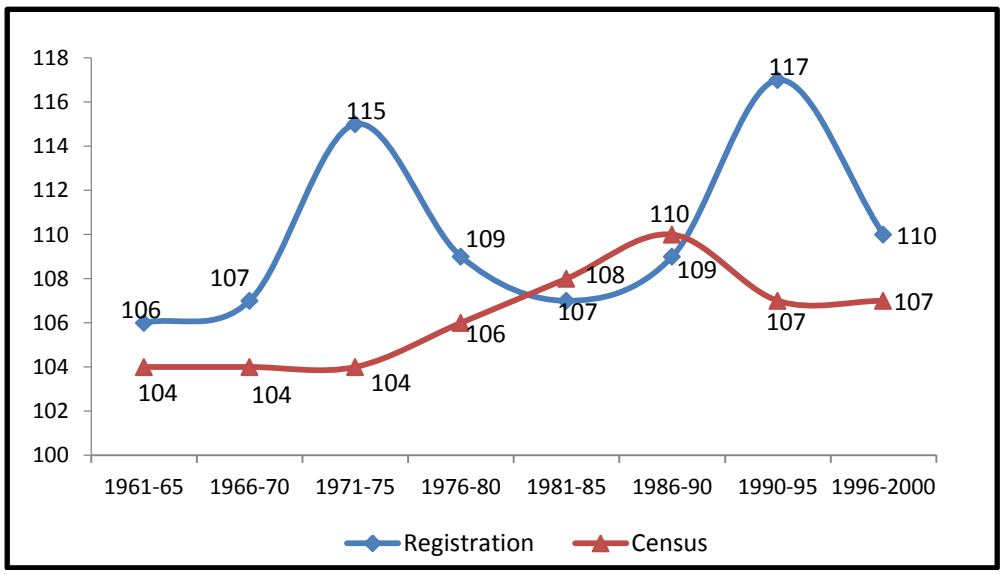


Table 3.2 Estimates of sex ratio at birth from Registration, Census and NFHS-3 Survey data in Greater Mumbai, 1961-2008

Year	Registration	Census	Survey
1961-65	106	104	*
1966-70	107	104	*
1971-75	115	104	*
1976-80	109	106	*
1981-85	107	108	116
1986-90	109	110	99
1990-95	117	107	122
1996-2000	110	107	90
2001-05	109	*	121
2006-08	109	*	

Not available

Figure 3.2: Trend in sex ratio at birth from different sources (1961-2000)



Even though the quality of birth registration in Mumbai is considered to be quite reliable, in order to check the consistency of registered births data a comparison has been made between estimates of sex ratio at birth from registration data and census data. From registration data sex ratio at birth has been directly estimated, while it has been reverse

survived from census data. As per figure, over the period of 40 years both registration data and census data reflects the different patterns of sex ratio at birth. As from earlier results it is shown that during the periods 1971-75 and 1991-95 sex ratios at birth in Greater Mumbai was extremely high, however sex ratios at birth estimated from census age returns do not show such high levels. Probably, though in general quality of registration of births is reliable there may be some problems in reporting during 1971-75 and 1991-95.

(B) Level and Trends of sex ratio at birth in Greater Mumbai

Table 3.1: Estimated Sex Ratio at Birth in Greater Mumbai, (1961-2008)

Year	Sex Ratio	Moving Average	Year	Sex Ratio	Moving Average	Year	Sex Ratio	Moving Average
1960	104		1977	108	111	1992	117	116
1961	106	105	1976	118	115	1993	116	120
1962	104	106	1977	108	111	1994	127	118
1963	108	106	1978	106	107	1995	111	116
1964	106	107	1979	106	106	1996	110	110
1965	108	107	1980	106	106	1997	109	110
1966	108	107	1981	106	106	1998	110	110
1967	106	107	1982	106	107	1999	110	110
1968	107	107	1983	108	107	2000	109	109
1969	107	107	1984	107	107	2001	109	109
1970	107	108	1985	107	107	2002	109	109
1971	111	110	1986	108	108	2003	109	109
1972	113	113	1987	108	108	2004	109	109
1973	115	115	1988	108	108	2005	109	109
1974	118	117	1989	109	109	2006	109	109
1975	119	118	1990	110	111	2007	109	109
1976	118	115	1991	115	114	2008	109	

Figure 3.1: Three year moving average sex ratio at birth during (1948-2008) periods in Greater Mumbai

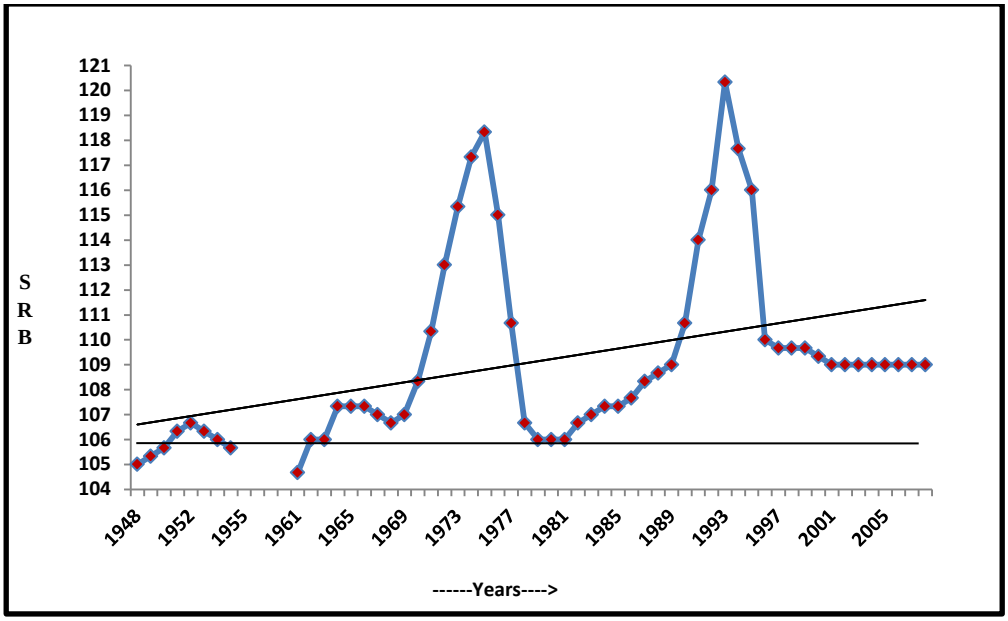


Figure 3.1 shows the trend of sex ratio at birth in Greater Mumbai over the last 50 years. The sex ratios at birth in Mumbai are available for all the post-independence period of 1947 to 2008, with the gap of 1955-1959. It is clearly shown (figure-3.1) that from the time of independence of India till 1961 the sex ratio at birth in Mumbai was in normal range of 103-107 male births per 100 female births. During 1960s fluctuations in sex ratio at birth have been observed, but the fluctuations were always in the normal range of 103-107. From 1961 to 2008, with the exception of 1978-80, it was always above 106. Study has shown that trend in sex ratio at birth in Greater Mumbai is non uniform over the period of 50 years.

Looking into overall trend, the overall sex ratio at birth shows an increasing trend. Broadly the sex ratio has registered an increase of 5 points from about 104 to 109. During the period 1961-2008, twice it has shown abnormally high values. Once during 1971-77 it increased from 111 in 1971 to the peak level of 115-118 during 1971-74 and again declined to

106 in 1978. Second time during 1988-94 it further increased from 108 in 1988 to 127 in 1994. After 1995 it again shows a declining trend from 111 to 109 in 2000. And at present it is stabilized at 109 males per hundred females. Though the present level of sex ratio at birth-109- is much lower than what is was during 1972 to 1974 and 1991-1995 but it is much higher than the natural one i.e. from 103 to 107.

3.5 Summary:

Broadly it is noticed that sex ratio at birth has shown an increasing trend in the past 50 years. There is no consistency in the pattern of sex ratio at birth in case of Greater Mumbai. During 1971 to 1975 period and 1991-1995 an extremely high increase in sex ratio at birth has been observed, and at present this ratio has been stable at level of 109. Though sex ratio at birth in Greater Mumbai is stable during last decade its level is much higher than the natural biological range of 103-107.

Even though comparisons of birth rates from National Family Health Survey-III (2005-06) and Sample Registration System for Greater Mumbai are in general agreement that registered births in Greater Mumbai is almost complete and reliable, but the excessive increase in sex ratio at birth during 1971-76 and 1991-95 periods is still unexplained.

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