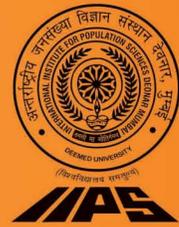




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## Understanding the role of ultrasound (USG) in improving maternal care in India

Sushanta K. Banerjee<sup>1</sup> & Sanjay K. Mohanty<sup>2</sup>

Reduction in maternal mortality and improvement in child sex ratio (ratio of girls to boys in the 0-6 age group) are two priority agendas of national and state governments in India. While there has been some tangible progress in reduction of maternal mortality ratio (MMR) in India, the child sex ratio has continued to deepen over the decades - it has declined from 945 during 1981 to 914 in 2011<sup>i</sup>. A recently published study has estimated 3.1-6 million sex selective abortions of girls in the last decade<sup>ii</sup>.

While the adverse child sex ratio in 1980s and 1990s may be attributed in part to gender differentials in infant mortality and child mortality and under-enumeration of child population, such differences have narrowed down over the last two decades. For example, in recent years the estimated infant mortality in India was 56 for boys and 58 for girls (per 1000 live births)<sup>iii</sup>. There has been improvement in census enumeration and the female undercount is minimal. Thus, the decline in child sex ratio is linked to fertility transition and strong son preferences in India<sup>iv</sup>.

It has been established that ultrasound has become more available in the last decade and sex selective abortions have become more common in educated and economically better off households and for second-order and third-order births<sup>ii,iv</sup>. On the other hand, the MMR has declined substantially: from 398 per 100,000 live births in 1997-98 to 212 per 100,000 live births in 2007-09<sup>v</sup>. However, research addressing this context has predominantly been restricted to exploring the causal relations between the use of ultrasound and prevalence of sex determination with limited focus to highlight the positive role of ultrasonography (USG) in maternal care.

Though the role of USG for identification of sex of the fetus has been established<sup>iv,vi</sup>, the linkages between pregnancy complications and the use of USG have rarely been explored. We believe that USG has acted as a double-edged sword in India's development. While it has saved millions of women from pregnancy-related complications and deaths, it has played a significant role in termination of pregnancies after determination of sex of the fetus. However, it is not clear how often USG is used for sex determination compared with its use to identify pregnancy-related complications.

Using the calendar data of the third round of National Family Health Survey (NFHS-3)<sup>iii</sup>, this study examines the linkages between pregnancy loss (including induced abortions, spontaneous abortions and still births), pregnancy complications and use of USG in India, based on 41,376 women who were pregnant anytime during the last five years. It argues that the increased use in USG is predominantly due to increase in prenatal care and it has played a pivotal role in identifying pregnancy complications and possibly has helped in saving women's life.

### Associations of use of USG, maternal mortality ratio and ante-natal care: A possible linkage

Among bigger states of India, the correlation coefficient of:

- Three or more ante-natal care (ANC) check-ups and MMR is -0.84
- Maternal mortality ratio (MMR) and utilization of ultrasound during pregnancy is -0.745
- Three or more ANC check-ups and the use of ultrasound during pregnancy is 0.86

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Studies also indicate that USGs are more frequently used among women seeking full antenatal care<sup>vi</sup>.

Figure 1a: Trends in Child Sex Ratio (1961-2011) in India

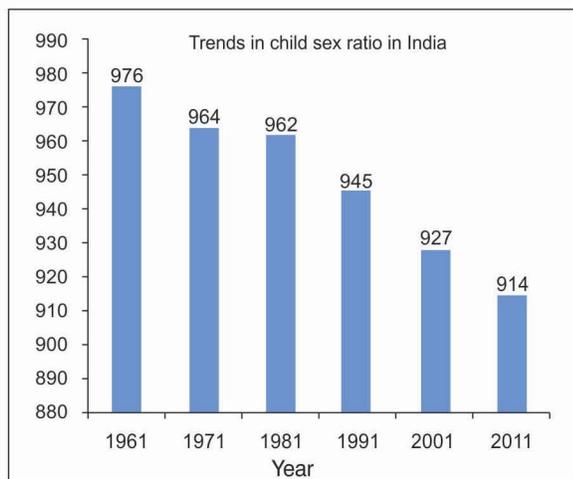
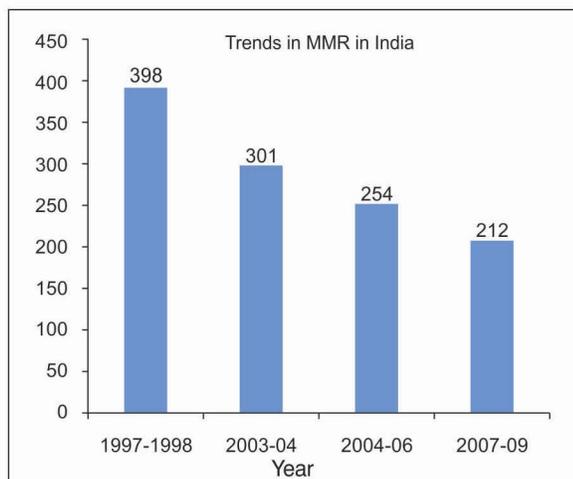


Figure 1b: Trends in Maternal Mortality Ratio (1997-2009) in India



Source: Provisional Population Total, paper 1 of 2011, Census of India 2011 and Special Bulletin on Maternal Mortality Ratio in India 2007-09

### Distribution of births, pregnancy loss and use of USG

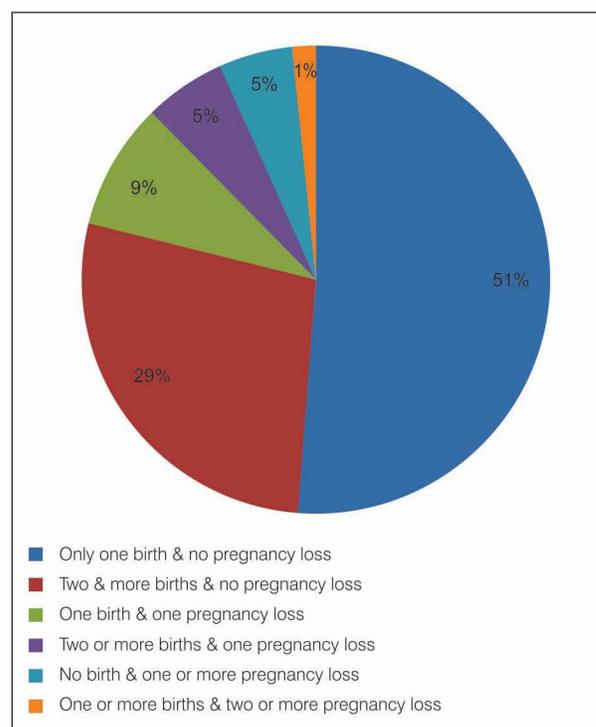
To understand the linkages of pregnancy loss, live births and the use of USG we have computed a composite variable by combining live birth and pregnancy loss of women in the five-year period. However, our analysis based on the NFHS data has some limitations as we cannot identify whether the loss is due to induced abortion, spontaneous abortion or still birth. The unit of analysis is women.

About half the women of reproductive age in India had a pregnancy in the five years preceding the survey. Among those women who were pregnant, 80% women had given one or more births in the given period without any pregnancy loss while 20% women had at least one pregnancy loss during one of their pregnancies.

Among those women who had at least one USG for any of their pregnancy (N=13,733) during the reference period:

- 80% had one (51%) or more (29%) live births without any pregnancy loss
- 9% had one live birth and one pregnancy loss
- 5% had one pregnancy loss and two or more live births
- 5% had one or more pregnancy loss and no birth
- 1% had two or more pregnancy loss and one or more birth (Figure 2)

Figure 2: Percent distribution of women who had undergone at least one ultrasound by outcome of their pregnancy in India, 2005-06

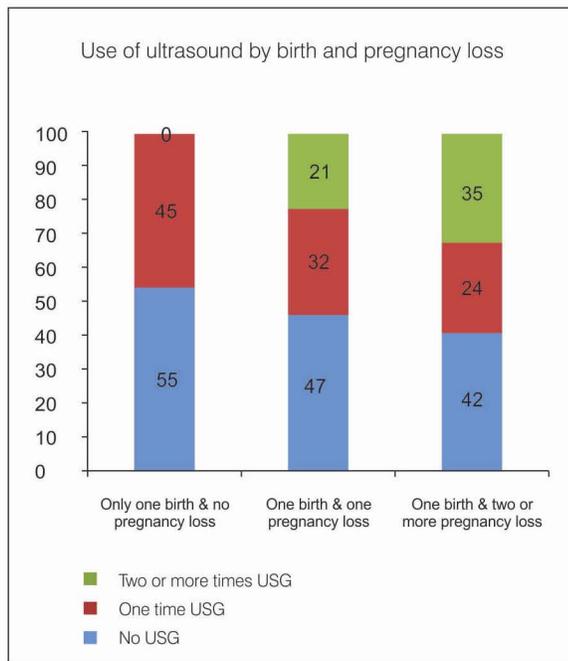


In other words, majority of the women who had undergone at least one USG had at least one live birth in the reference period (four-fifth). We also observed that among women who had only a live birth, 29% had a USG compared to 36% among those who had at least one pregnancy loss or both live births and pregnancy loss.

### USG by birth and pregnancy loss

We also analyzed the differentials in USG by live births and pregnancy loss after controlling parity. Results are shown (Figure 3) for those women who had only one live birth during the last five years and in parity one. Results show that among women who had given live birth in the reference period and did not have any pregnancy loss, a significantly higher proportion (45%) of them availed the USG test. These women were not seeking USG for identification of sex of the fetus but were possibly interested in the development of the fetus based on a medical practitioner's advice.

Figure 3: Among women who had only one birth and no, one or more than one pregnancy loss, percentage of women who underwent USG during the pregnancy



### Pregnancy complications and role of USG

To understand the role of USG in improving maternal health, we have examined the association between use of USG and the experience of pregnancy complications and alertness to complications during pregnancy, among women who had one birth in the reference period. We have confined the analyses only to those women who had only one birth in the reference period to link the role of USG to that particular birth. Furthermore, the questions on antenatal care were asked only with reference to the last birth of the woman. However, the sample size is sufficiently large (more than 16,000 women) to draw valid inferences.

It is found that among women who were alerted for pregnancy complications like vaginal bleeding, 64% of them were likely to go for USG compared to 38% who were not alerted to vaginal bleeding (Table 1). Similarly, among women who were alerted to any of the three pregnancy complications (vaginal bleeding, convulsion but not due to fever and prolonged labour), 60% had undergone USG compared to 37% of their counterparts who were not alerted to any pregnancy complication. Among women who had experienced any pregnancy complications such as vaginal bleeding and/or swelling of hand and body were also more likely to have undergone USG.

Table 1: Pregnancy complication and use of USG among women who had one live birth during 2001-06, India

Alerted to / experienced pregnancy complications	No USG	Had at least one USG	Total number of women
Alerted to vaginal bleeding during pregnancy			
No	61.9	38.1***	13,772
Yes	35.6	64.4***	3,188
Alerted to pregnancy complications: convulsions			
No	60.7	39.3***	13,999
Yes	39.0	61.0***	2,954
Alerted to pregnancy complications: Prolonged labour			
No	61.9	38.1***	13,098
Yes	40.0	60.0***	3,857
Alerted to either vaginal bleeding/convulsion/ prolonged labour			
No	63.4	36.6***	12,299
Yes	39.9	60.1***	4,656
Experienced body or face swelling			
No	63.6	33.7***	15,258
Yes	59.1	40.9***	5,580
Experienced vaginal bleeding			
No	65.0	35.0***	19,873
Yes	50.6	49.4***	955
Experienced either swelling or vaginal bleeding			
No	66.8	33.2***	14,669
Yes	58.6	41.4***	6,153

\*\*\*: Differences in USG are significant at  $p \leq .001$

These differences remain even after controlling for educational level, antenatal care during pregnancy, wealth status of the household, age of the woman, number of surviving children. For example, among those women who had 10 or more years of schooling and were alerted to any pregnancy complications 79% of them went for a USG compared to 68% among those who were not alerted for pregnancy complication (Table 2). The variations are more pronounced among women who never attended school. For example, among women who had never attended school were alerted to pregnancy complications, 34% went for a USG test compared to 16% of their counterparts who were not alerted for pregnancy complications. A same line of variation is accounted among women who had three or more antenatal care visits. Among women who had three or more antenatal visits and were alerted for any pregnancy complications, 69% of them went for a USG compared to 51% among those who were not alerted for pregnancy complications.

Table 2: Percentage of women went for an USG (only those given one birth) by educational level, antenatal visit and pregnancy complication in India

Education of women and ANC visit	Alerted to any pregnancy complications during pregnancy		Experienced any pregnancy complications	
	No	Yes	No	Yes
<b>Education of Women</b>				
No schooling	16.4	34.1	12.9	14.3
up to 5 years	23.9	41.1	18.8	31.2
6-9 years	44.1	58.7	38.6	46.0
10 years and above	68.4	79.0	69.2	75.2
<b>Three or more ANC</b>				
No	14.2	28.2	10.1	11.3
Yes	50.5	68.5	54.5	60.4

*Differences in USG are significant at  $p \leq .001$  among those alerted/experienced pregnancy complications and those who were not alerted/experienced pregnancy complication at each level of education and antenatal visit*

### Probable use of USG for sex selection and monitoring of Pregnancy: A multivariate analysis

To identify the probable incidence of use of USG test for sex selective abortions we have computed a variable by combining the pregnancy loss since 2001 and use of USG during that pregnancy. We found that among all married

women who were pregnant in the last five years, about 5.4% women who had reported at least one pregnancy loss (still birth, spontaneous abortion and induced abortion), had also undergone a USG test during the reference period. Thus, there is a high likelihood that a portion of these 5.4% women (excluding still births, and spontaneous abortions, major fetal anomalies and pregnancies endangering mother's health) had opted for a sex selective abortion.

However, a substantial majority of women had undergone USG tests for diagnostic and routine monitoring of pregnancy. A multivariate analysis conducted to assess the influencing attributes of the use of USG after controlling the socio-economic confounders also found that the use of USG test is significantly ( $p < 0.01$ ) higher among women alerted with pregnancy complication (odds ratio: 1.5) and experienced complications during pregnancy (odds ratio: 1.2) and had availed three or more ANC check-ups (odds ratio: 2.1). The analysis has also shown a higher likelihood of use of USG amongst women with only daughter (odds ratio: 1.1) compared to their counterparts with only one son (results are not shown here).

### Summary of findings

We summarize our findings as:

1. Among women who had undergone USG, 80% of them had given live birth and 20% had either had a pregnancy loss or both live births and pregnancy loss.
2. The correlation coefficient of ANC and use of USG is 0.86 indicating that women seeking ante-natal care are more likely to undergo USG test to monitor the pregnancy and of the fetus.
3. Among mothers in parity one and one birth in the reference period with no pregnancy loss, 45% of them had undergone USG test.
4. Women who were alerted for any pregnancy complications such as vaginal bleeding, convulsions and prolonged labour were significantly more likely to have undergone a USG test.
5. Controlling for socio-economic confounders, women who had experienced pregnancy complications such as vaginal bleeding or swelling of hand, leg and body were more likely to go for a USG test compared to those who did not have any pregnancy complications.
6. About 5.4% women with USG test were estimated to have induced abortion, still births and miscarriages. Thus a segment of these were more likely to have gone for sex selective abortion in the reference period.

## Conclusion:

Based on the analyses, we conclude that USG has a diverse role during pregnancy that ranges from tracking the development of the fetus to identification of the sex of the fetus. By enabling detection of pregnancy-related complications, USG has played an important role in improving maternal health outcomes across the country and it will be wrong to solely associate the increasing availability of USG to the increase in sex selective abortions. Extended research is needed to further elaborate on this association which will contribute in determining the need of and devising specific USG-related measures in curbing the practice of sex selection in India.

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**Sushanta K. Banerjee** holds master's and doctoral degree in population studies from International Institute for Population Sciences, Mumbai, India. As Senior Advisor (R&E) of Ipas, Dr. Banerjee is responsible for providing technical guidance and implementing monitoring and evaluation activities in India. Prior to his association with Ipas, Dr. Banerjee was technical director of Population Services International (PSI) India for more than three years. He joined Ipas in May 2006 with a decade of relevant experience monitoring and evaluating programs, designing studies, and developing evidence-based behavior change communication strategy in reproductive and child health. Dr. Banerjee has led several large-scale surveys in India, and worked with a variety of international organizations, including Futures Group International, Taylor Nelson Sofres India, and the International Institute for Population Sciences. Dr. Banerjee's research and evaluation works on population and reproductive health are widely published in peer reviewed journals and edited books.

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