

**Note**

**Inter-district variation in socio-economic inequalities in maternal healthcare utilisation in rural Assam, 2007-08**

Aditya Singh, Saradiya Mukherjee, and Rakesh Chandra

Using data from third round of District Level Household Survey conducted in 2007-08, the study attempts to measure socio-economic inequality by type of maternal care-antenatal care, delivery care and postnatal care in rural Assam, with a focus on inter-district variations. Results indicate that the utilisation of maternal health care in the state is characterised by substantial pro-rich inequalities. The inter-district disparity in socio-economic inequality in maternal health care is also conspicuous. The efforts to increase the average without a component of equity in the programme could actually further aggravate existing pro-rich inequalities. In the light of immense inter-district variation in the level of socio-economic inequality in maternal health care utilisation, any future efforts by government or any other stakeholders should, not only focus on improving overall utilisation level, but also on reducing inter-district variation in socio-economic inequalities.

**Keywords:** Socio-economic inequalities; Assam, Maternal health care, Concentration index, Health.

**Introduction**

Assam is the largest among the states of North-East India and known for its natural beauty and a distinct Assamese culture. However, it is plagued by high levels of poverty, low levels of human development and other challenges. Maternal health is one such area where Assam's record has been very poor in the past. The state is infamous for its high maternal mortality ratio which stands as high as 390 maternal deaths per hundred thousand mothers per year during 2007-09 (ORGI, 2011). Essential maternal healthcare during pregnancy, delivery and postnatal periods could reduce the chance of maternal death

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and improve overall health not only of mother but also of new-born (Graham et al. 2000; Koblinsky et al. 1999). Accordingly, the Millennium Development Goal (MDG) 5 calls for universal access to reproductive health care by the year 2015 (Nanda et al.2005).

Although, from policy perspective, improving averages is always a priority, the component of equity must be incorporated to ensure greater welfare. The component of equity has been ignored in the policy in India in general and Assam in particular. Therefore, it is not surprising that a considerable amount of literature in past has documented vast socio-economic and regional disparities in health and healthcare utilisation (Mohanty and Pathak 2009; Pathak and Mohanty 2010; Pathak et al. 2010; Kumar and Mohanty 2011). In the era of decentralisation, it is necessary for policy makers to understand inter-district variation in health and health care related socio-economic inequalities because that could help them identify and target inequality ridden districts and use available resources efficiently.

This study, therefore, focuses on unmasking district level patterns of socio-economic inequalities in maternal healthcare utilisation in rural Assam. The study focuses only on rural areas due to two reasons – first, urban areas generally have a very different service utilisation pattern; second, including urban areas in the same paper could distort the focus and clarity of this work. The study uses most recent data from a nationally representative survey, known as District Level Household Survey (DLHS), especially designed to provide demographic and health related estimates at district level.

## **Data**

We use the latest round of DLHS conducted during 2007-08. It is a large scale, nationally representative, multi-round survey covering 611 districts in 34 states and union territories of India. It is the largest ever demographic and health surveys carried out in India, with a sample size of about seven hundred thousand households. DLHS-3 like its former versions DLHS-1 and DLHS-2 was basically designed to provide reliable district level information on maternal and child health, family planning and other reproductive health indicators (IIPS 2010).

The survey adopted a multi-stage stratified probability proportion to size sampling design. In each district, 50 Primary Sampling Units (PSUs) or villages from rural areas and wards from urban areas were selected in the first stage by systematic Probability Proportional to Size (PPS) sampling. At the second stage, the required numbers of households were selected within each village using systematic sampling. Circular systematic sampling was adopted for the selection of households from the villages. DLHS-3 surveyed a total of 30,243 ever-married women in Assam with a response rate of 93.9 percent. The sample of this study included 9,028 currently-married women from rural Assam.

## **Definition of the variables**

We used four variables in this study. Antenatal check-up (ANC), safe delivery and post-natal care (PNC) were three maternal health care service utilisation variables and wealth index was used a proxy for economic status of the household.

A mother was said to have received adequate ANC when she had four or more

antenatal check-ups (ANC) during pregnancy. This variable was coded “1” if the mother had four or more ANC and “0” otherwise. Safe delivery was defined as any delivery conducted under the supervision of a skilled health professional which included Doctors, Lady Health Visitor, Auxiliary Nurse and Midwife or any other skilled health personnel. It was coded as “1” if delivery was assisted by any of the above mentioned health professionals and “0” otherwise. Similarly, a woman was said to receive a PNC only when she had at least one health check-up after delivery. PNC was coded as “1” if the mother had a post natal check-up at least once after 42 days of the delivery and “0” otherwise.

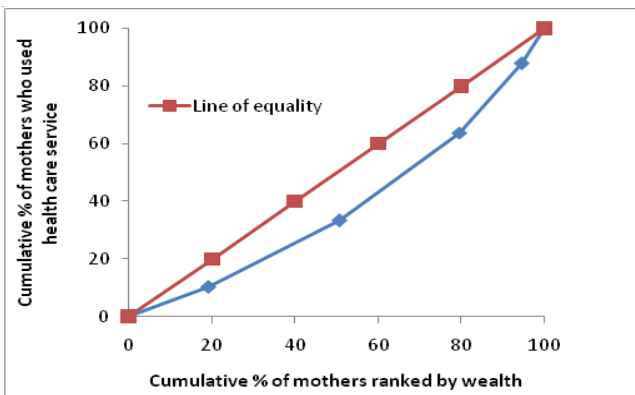
DLHS-3 did not collect information on income of the household so there was no other way to measure the economic status of the household. However, it collected information on household amenities and assets. These variables could be used to construct a proxy variable for economic status (Montgomery et al. 2000). Hence, using Principal Component Analysis (PCA), we constructed a proxy variable for socio-economic status of the household called “Wealth Index”. The wealth index was divided into quintiles (five equal parts) – Poorest, Poorer, Middle, Richer, Richest. This lowest 20% were categorised as “Poorest” and next 20% as “poorer” so on so forth. The use of household wealth index as a proxy for economic status has been a standard practice in the past (Vyas and Kumaranayake 2006; Filmer and Pritchett 2001).

## Methods

To measure equity in any health care outcome, we require a health outcome variable (safe delivery or postnatal check-up), a stratifying variable capturing socio-economic status against which the distribution of health outcome to be assessed (wealth index), and a measure of socio-economic inequality to quantify the degree of inequity in the health outcome variable. We used Concentration Index (CI) to measure the level of socio-economic inequality in all three indicators for maternal health care utilisation in Assam.

The CI of a health care variable  $y$  (any health care service) can be defined using the concentration curve (Fig. 1) that links the cumulative proportion of individuals ranked by wealth to the corresponding cumulative proportion of health care variable. The concentration curve plots shares of the health care variable against quintiles of the measure of socio-economic status i.e. wealth index.

Figure 1. An example of Concentration Curve



The CI is a measure of overall socio-economic inequality and is defined as twice the area between the concentration curve and the line of equality (O'donnell et al., 2008). The value of CI varies between  $-1$  to  $+1$ . A positive value of CI implies that the health outcome is concentrated among the rich population, while a negative value indicates the opposite condition. A value of zero implies that the health care variable is equally distributed across the wealth status (O'Donnell et al. 2008). The CI could be calculated using unit data (as in our case) using following formula –

$$C = \frac{2}{n\mu} \sum_{i=1}^n h_i R_i - 1$$

Where  $h_i$  is the health care variable,  $\mu$  is the mean of  $h_i$ , and  $R_i$  is the fractional rank of the individual  $i$  in the distribution of socio-economic status ( $R_i = 1/n$ ;  $i=1$  for poorest and  $i=n$  for the richest).

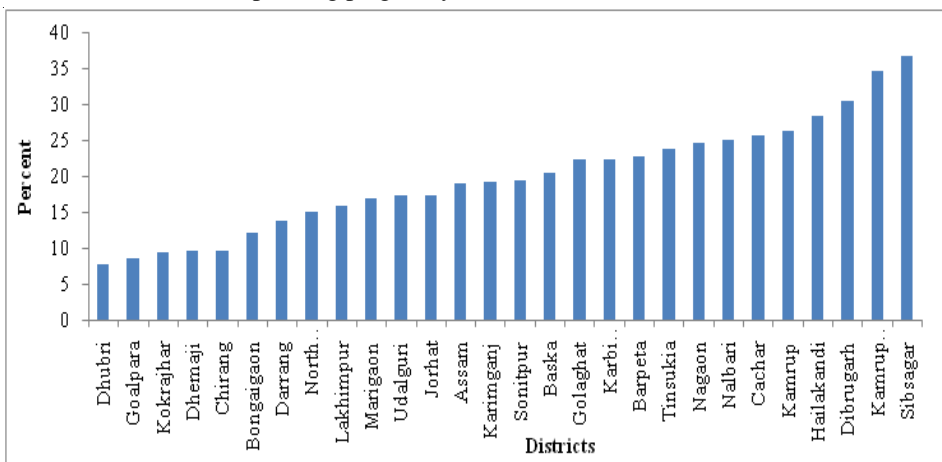
We used “Stata” SE 12.0 and SPSS 20 statistical software to conducted computations (Stata Corp. 2011).

## Results and discussion

### *Antenatal care*

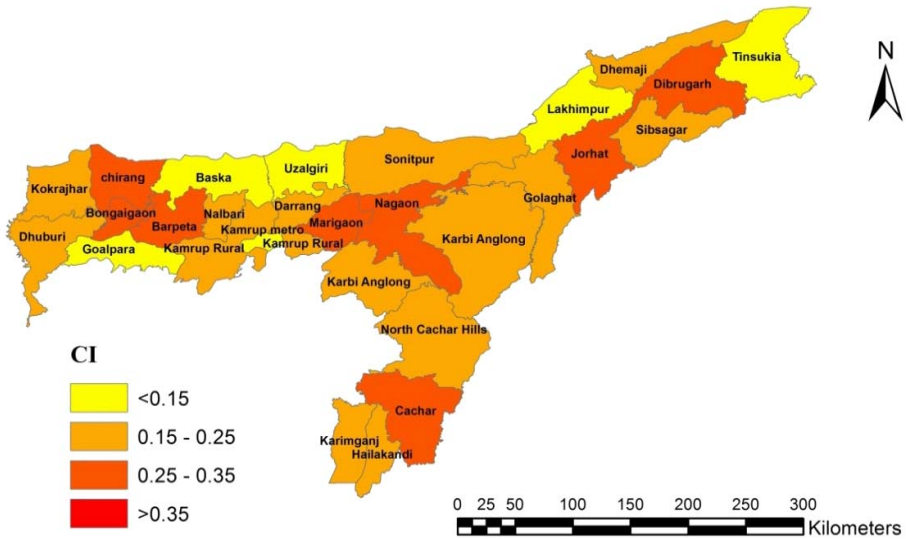
At the national level, about 25 percent of all mothers had four or more antenatal check-up during 2007-08 whereas the proportion of such mothers in Assam was just 19 percent which is lowest among all North-East (NE) states. District-wise differentials are also prominent. At one end of the spectrum are districts like Dhubri, Gopalpara, Kokrajhar, Dhemaji and Chirang where only 10 percent or fewer mothers had four or more ANC's. On the other hand of the spectrum are the districts like Dibrugarh (30%), Kamrup (34%), Sibsagar (25%) where this proportion goes even well above national average (Fig. 2).

Figure 2: Percentage of currently married women who had four or more antenatal check-up during pregnancy in rural Assam, 2007-08



The proportion of mother with four or more ANC's in Assam is obviously well below national average (25.7%) but the pattern of rich-poor gap in ANC's coverage is similar to that found at national level. At nation level, about 56 percent women from richest quintile went for 4+ ANC's during pregnancy, whereas the proportion of such women from poorest quintile was about 10 percent which suggests a huge rich-poor gap.

Map 1: Inter-district variation in the level of socio-economic inequality (as measured by concentration index) in antenatal care in rural Assam, 2007-08

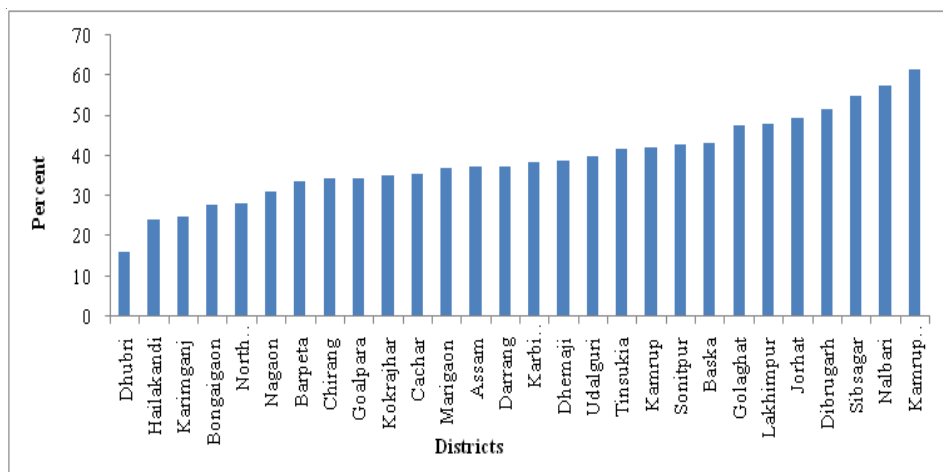


Similarly, in Assam the proportion of mothers from richest quintile having four or more ANC's (56.6%) was about six and half times that of mothers from poorest quintile (8.9%). Since, this gap analysis ignores other quintiles in the distribution, we calculate concentration index. It turns out that the socio-economic inequalities in ANC measure by CI at national level are more (CI=0.30) than in the state of Assam (CI=0.24).

### Safe Delivery

About 42 percent of all mothers in rural India had a safe delivery during 2007-08 compared to 37 percent in rural Assam. This proportion of mothers having a safe delivery in rural Assam is lowest among NE states (except Meghalaya where only one-fourth of mothers had safe delivery). The proportion of safe deliveries varies from district to district in Assam. The lowest proportion of mothers having safe delivery was found in the districts of Dhubari (16%), Hailakandi (24%), Karimganj (25%), Bogaigaon (28%) and North Cachar Hills (28%). On the other hand, Dibrugarh (52%), Sibsagar (55%), Nalbari (58%) and Kamrup Metro (62%) were the districts where more than 50% mothers went for a safe delivery (Fig. 3).

Figure 3: Percentage of currently married women who had a safe delivery in rural Assam, 2007-08



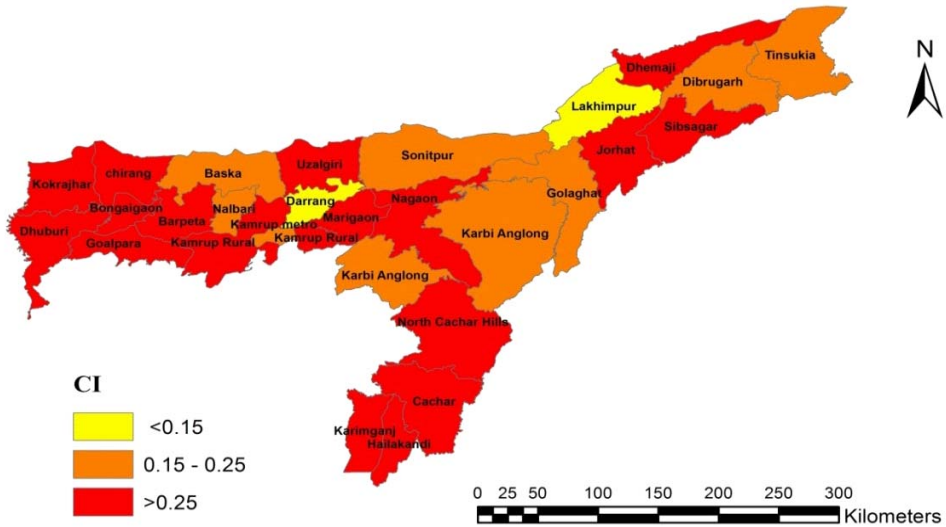
The rich-poor gap is also large in Assam as compared to overall India. The proportion of mothers from richest quintile going for safe delivery was 3.45 times higher than that of mothers from poorest quintile in India as a whole. While, in rural Assam, this ratio (rich/poor) was a little higher (4.15) suggesting that the absolute gap was bigger in Assam compared to India as a whole. However, this does not mean that socio-economic inequality was also higher as compared to India as measured by CI. It was observed that the CI for safe delivery in Assam (CI=0.23) and India (CI=0.23) did not differ even slightly. This means that the distribution of women going for safe delivery across wealth quintiles in Assam was same as found for rural India despite the fact that rich-poor ratio is larger in Assam than in India as a whole.

District level analysis reveals that there is substantial variation in the level of socio-economic inequality in safe delivery practice across districts of Assam. Highest inequality in the utilisation of delivery care was found in Marigaon (CI=0.41) district which is about three and half times higher than the lowest inequality found in Lakhimpur district (CI=0.12). Other districts with higher socio-economic inequality (with CI  $\geq$  0.35) were Kamrup Metro (CI=0.36), Kokrajhar (CI=0.38), Jorhat (CI=0.38), and North Cachar Hills (CI=0.38). Apart from Lakhimpur, Darrang (CI=0.13) also showed a low socio-economic inequality in the utilisation of delivery care by mothers (Map 2).

### **Postnatal care**

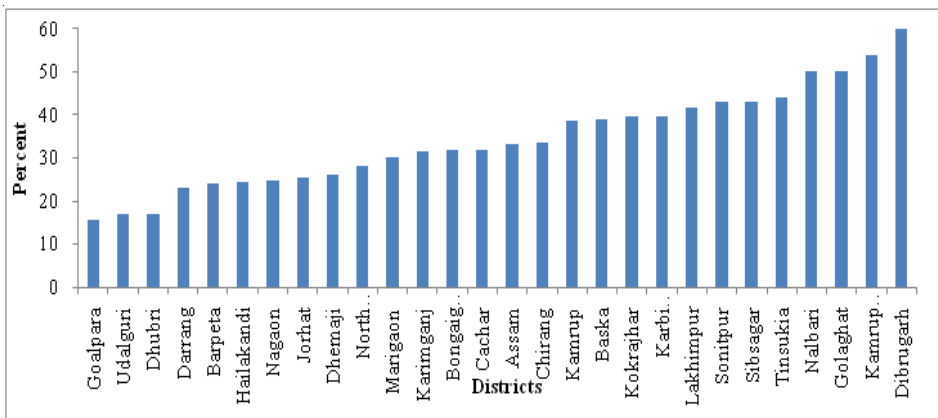
About 42% mothers in rural India went for postnatal check-up where this proportion was just 33% in rural Assam. The utilisation of postnatal care in Assam was one of the lowest among NE states (Tripura with 28% of mothers having PNC was the state lowest utilisation of postnatal care). District wise variations were also very obvious from the analysis. On one hand there were districts where more than 50% of mothers had at least a postnatal check-up within 42 days of the delivery. On the other hand, there were some

Map 2: Inter-district variation in the level of socio-economic inequality (as measured by concentration index) in delivery care in rural Assam, 2007-08



districts where the proportion of mothers having at least a PNC within 42 days of the delivery was well below 20 percent. Districts with highest utilisation were Dibrugarh (62%), Kamrup Metro (54%), Golaghat (50%) and Nalbari (50%) and the districts with lowest utilisation were Goalpara (16%), Udalgiri (17%) and Dhubari (17%) (Figure 4).

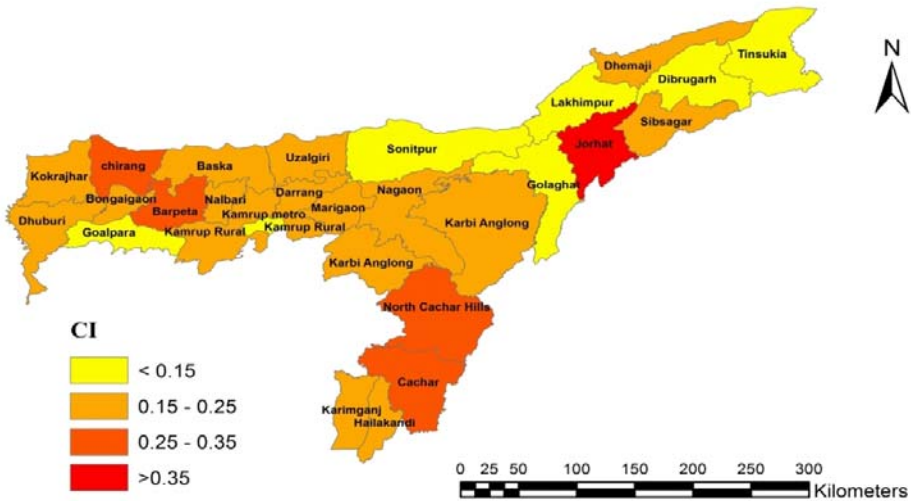
Figure 4: Percentage of currently married women who had at least one postnatal check-up within 42 days of delivery in rural Assam, 2007-08



The utilisation of PNC among mothers from the richest quintile in Assam was almost three and half times higher than that of mothers from poorest quintile. The pattern is

similar to the one found for rural India as a whole. This slightly larger gap for rural Assam as compared to rural India does not necessarily mean that the socio-economic inequalities as measured by CI will also follow the same pattern. However, in this case we did find that the level of inequality across the wealth quintiles in rural Assam (CI=0.21) was slightly higher than that of rural India as a whole (CI=0.19).

Map 3: Inter-district variation in the level of socio-economic inequality (as measured by concentration index) in postnatal care in rural Assam, 2007-08



Similar to ANC and delivery care, we found a great inter-district variation in socio-economic inequality in the utilisation of postnatal care as well. The highest socio-economic inequality in PNC use was found in Jorhat district (CI=0.37) which turns out to be 3.7 times higher than the lowest socio-economic inequality found in Goalpara district (CI=0.10). Other districts with small socio-economic inequality were Goalpara, Lakhimpur and Dibrugarh while Barapeta, North Cachar Hills and Cachar showed higher socio-economic inequalities in utilisation of postnatal care (Map 3).

## Conclusion

Using data from the third round of DLHS conducted during 2007-08, we tried to explore the district level patterns of utilisation of maternal health care in rural Assam. Additionally, we also explored the patterns of socio-economic inequality in the utilisation of maternal healthcare. The level of maternal health care utilisation in Assam is still low characterised by a considerable district level variation. We also found considerable variations in maternal healthcare use across wealth quintiles. The utilisation among poor mothers was considerably lower than among rich mothers. Using CI to capture this disparity, we found that there was a large socio-economic inequality in utilisation of all three kinds of maternal healthcare in rural Assam. Inter-district variation in socio-economic inequalities was also noticeable.

Low levels of maternal healthcare utilisation coupled with substantial inter-



district variation could be one of the obstacles which must be removed to achieve millennium development goal 5 within time. However, reducing pro-rich socio-economic inequality is also a formidable challenge to the government and other stakeholders working to improve the maternal health in the state. In the light of immense district level variation in the level of socio-economic inequality in utilisation of maternal health care, efforts should not only focus on improving overall utilisation but also on reducing inter-district variation in socio-economic inequality.

## References

- Filmer, D, H Pritchett (2001): "Estimating wealth effects without expenditure data or tears: An application to educational enrolments in states of India", *Demography* 38(1): 115.
- Graham, WJ, JS Bell, CHWBullough (2000): "Can skilled attendance at delivery reduce maternal mortality in developing countries?" *Studies in Health Services Organization and Policy* 17: 97–130.
- International Institute for Population Sciences (IIPS) (2010): "District Level Household and Facility Survey (DLHS-3), 2007-08": India. Assam: Mumbai:IIPS.
- Koblinsky M, O Campbell, J Heichelheim (1999) "Organizing delivery care-what works for safe-motherhood?", *Bulletin of World Health Organization* 77(5): 399–406.
- Kumar, A, SK Mohanty (2011): "Intra-urban Differentials in the Utilisation of Reproductive Healthcare in India, 1992-2006", *Journal of Urban Health* 88(2):311-328.
- Mohanty, SK, PK Pathak (2009): "Rich-poor gap in utilisation of reproductive and child health services in india, 1992-2005", *Journal of Biosocial Science* 41: 388-398.
- Montgomery, MR, M Grangnolati, MKA Burke, E Paredes (2000): "Measuring living standards with proxy variables", *Demography* 37(2):155–174.
- Nanda, G, K Switlick, E Lule (2005): "Accelerating progress towards achieving the MDG to improve the maternal health: A collection of promising approaches", Health, Nutrition and Population (HNP) Discussion Paper, The World Bank, Washington D.C., USA. Available at <http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/NandaAcceleratingProgresswithCover.pdf>
- O'Donnell O, EV Doorslaer, A Wagstaff, M Lindelow (2008): "Analysing health equity using household survey data: A guide to techniques and their implementation", World Bank Institute Learning Resource Series, The World Bank, Washington, D.C.
- ORGI (2011): "Special bulletin on maternal mortality in India 2007-09", Sample Registration System, Office of Registrar General, India (ORGI), New Delhi.
- Pathak, PK, A Singh, SV Subramanian (2010): "Economic inequalities in maternal health care: prenatal care and skilled birth attendance in India, 1992-2006", *PLoS ONE* available at: (accessed on July 24, 2012.) <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0013593>

Pathak, PK, SK Mohanty (2010): “Does the safe-motherhood programme reach the poor in Uttar Pradesh, India”, *Asian Population Studies* 6(2): 173-191.

Stata Corporation (2011): *Stata Statistical Software: Release 12*. Texas: College Station, StataCorp LP.

Vyas S, L Kumaranayake (2006): “Constructing socio-economic status indices: how to use principal component analysis”, *Health Policy and Planning* 21(6): 459–468.