Indian Journal of Spatial Science Vol - 6.0 No. 1 Summer Issue 2015 pp. 1 - 73

Indian Journal of Spatial Science

EISSN: 2249 - 4316 homepage: www.indiansss.org ISSN: 2249 - 3921

Status of Maternal Health in West Bengal

Alokananda Ghosh[1]
Dr. Biswaranjan Mistri[2]

[1]UGC-JRF, Department of Geography, University of Burdwan, West Bengal, India
[2]Assistant Professor, Department of Geography, University of Burdwan, West Bengal, India

Article Info

Article History
Received on:
22 January 2015
Accepted in *Revised Form* on:
27 February 2015
Available *Online* on and from:
23 March 2015

Key Words
MDGs
NRHM
Reproductive Health
Maternal Health
ASHA
MMR

Abstract

India is committed to achieve the Millennium Development Goals (MDGs, 2000) to improve maternal health status. To concretise such commitment, the country has launched the National Rural Health Mission (NRHM, 2005), which aims to improve the rural health facilities in general, and especially the access to quality health care for poor women and children living in rural areas. This study has tried to identify the inter-district disparity in maternal health status of West Bengal. The data have portrayed that socio-economic status having a positive correlation with both the level of awareness (regarding reproductive and maternal health) and status of maternal health service facility. The deprived sections of the society are having an adverse affect on their maternal and reproductive health. As a result, the districts which are holding higher ranks in the vulnerability status of pregnancy and maternal health outcome, where the concentration of Scheduled Castes (SCs), Scheduled Tribes (STs) and Muslims are high, like- Paschim Medinipur (1st), Koch Bihar (2nd), Murshidabad (3rd), Birbhum (4th) and Maldah (5th). Though the health infrastructure is quite satisfactory in Murshidabad (9th), Birbhum (7th) and Koch Bihar (1st) yet institutional deliveries are not common practice. Maldah (19th), Murshidabad (14th), Birbhum (10th) and Koch Bihar (12th) are occupying an alarmingly miserable position in this regards. Consequently delivery and post delivery complications become the main controlling factor for the vulnerable pregnancy and maternal health outcome. To accomplish the MDGs 'Target-5' approaches by the year 2015, there is a need to pay more attention in these districts through ensuring maximum maternal health facility and health workforce which will upgrade their maternal health status more effectively.

Introduction

Keeping mothers alive and healthy is good for women, their families, and society. Reproductive health related complications during pregnancy and childbirth as well as from Sexually Transmitted Infections (STIs), Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) are among the leading causes of death and disability among women of reproductive age (15-49) in developing countries (Lule E. , Ramana, Ooman, Epp, Huntington, & Rosen, 2005). Maternal Mortality Rate (MMR) is not the only adverse outcome of pregnancy. Because of miscarriages, induced abortions, and other factors, more than 40% of the pregnancies in developing countries, result in complications, illnesses, or permanent disability for the mother or the child (WHO, 2001). India is committed to achieve the MDGs to control maternal mortality (MDG-5) (Triveni, Bhojani, Mishra, Amruthavalli, Devadasan, & Munegowda, 2012) which is on its way to get concretised through the launching of National Rural Health Mission (NRHM, 2005-2012) by the Government of India in 2005-06 to provide effective health care to rural population in the country with special focus on those states which have poor health outcomes and inadequate public health infrastructure as well as manpower and in most cases deprived from the health facilities (Shekhar, et al., 2010). The third round of the District Level Family and Health Survey (DLHS) carried out during 2007-'08 has been designed to collect data at district level on various aspects of healthcare utilization

from as Reproductive and Child Health (RCH), accessibility of health facilities, assess the effectiveness of Accredited Social Health Activist (ASHA, 2005) and Janani Surksha Yojona (JSY, 2005) in promoting RCH care, to assess health facility capacity in terms of infrastructure (Shekhar, et al., 2010).The DLHS-3 (2007-'08) is the third in the series of district level household surveys after the first one (1998-'99) and the second (2002-'04).

Objectives

To identify the status of maternal health in West Bengal, following objectives have been taken into account—

(i) District wise identification of the MDG-5 Status considering the DLHS-2 and DLHS-3 reports in view of MDG-5 indicators in West Bengal,

(ii) Assessment of the evidence of improvement for different districts regarding MDG-5 Status from DLHS-2 to DLHS-3,

(iii) Positional classification of different districts of West Bengal in the Index of Vulnerability, Awareness, Contraceptive Prevalence, Health Facility and Infrastructure,

(iv) Recognisation of the position of districts in the Maternal and Reproductive Health Outcome Index,

(v) Identification of the controlling factors behind the MDG-5 status and Vulnerable Maternal and Reproductive Health Outcome status through Principal Component Analysis.

Materials and Methods

This paper is based on the data have been collected through (i) Census (2011), (ii) DLHS-2 (2002-'04) and 3 (2007-'08), (iii) District Statistical Handbooks of the Birbhum District (2011), (iv) Data received from ChiefMedical Officer of Health (CMOH), Birbhum (v) Different health reports published by Govt. of India and Govt. of West Bengal like- reports from National Rural Health Mission (NRHM), Ministry of Health and Family Welfare (MHFW), RCH, Sample Registration System (SRS) and other institutions. The statistical analyses are performed using Microsoft Office Excel, 2007 and SPSS, Version 15 (SPSS Inc., Chicago, Illinois, USA, 2009) and spatial distributions have been mapped through ArcGIS, Version 9.3 (Esri Developers Summit, 2008) (Fig.1).

Study Area

The state of West Bengal is located in the eastern part of India and is the nation's fourth most populous state, with around 9.13 crores inhabitants, spread over an area of 88.75 km^2 as per census 2011. The state comprises 1028 persons per km^2 area (2011). The geographical location of the state is quite unique. In the north, it is bordered by Sikkim and countries like- Nepal, Bhutan, where as the southern part is edged by the vast sea of the Bay of Bengal. Bangladesh has covered the eastern part and states like- Bihar, Jharkhand and Orissa are situated in the western part of the state. Though the state comprises with 20 districts at present, but the study has been done on 19 districts, except very recently (25th June, 2014) created district, Alipurduar.

Results and Discussion

There is a vast disparity within 19 districts of the State in terms of literacy rate of the population, decadal growth rate, concentration of SCs, STs and Muslims, what every time leaving an imprint on the health status through their ethno-cultural constructive. Along with the differential aspects of health facility status, prevalence of contraceptive measures, scenario of Antenatal Care (ANC) coverage and awareness level regarding maternal and reproductive health seem to have direct influence on the women, fertility and mostly to the maternal health of the specified geographical area.

Status of Maternal Health Service Facility (MHSF)

The health facility status index has been calculated considering the health facilities prevailing in the rural West Bengal. Purulia (17), Purba Medinipur* (18), Paschim Medinipur (16) along with Maldah (14) and Dakshin Dinajpur (15) ranks lowest in the health facility index. The districts, which accounts highest rank in this score index are- Koch Bihar (1st), Darjiling (2nd) and 24 Paraganas (N), lying at third position, where as Haora, Hugli and Barddhaman are in a safe situation. On the other hand, the districts like-Uttar Dinajpur (12th), Birbhum (7th), Murshidabad (9th) and Nadia (11th) are showing a moderate to good heath infrastructural facility status. But in case of ANC coverage, Birbhum, Uttar Dinajpur and Murshidabad are screening an opposition with the status of health infrastructural prevalence. As the health service status is high, the ANC coverage is expected to be in a convincing position but here ANC coverage of Birbhum and Murhsidabad accounts only for 15% to 20% for the married women belonging to reproductive age group (15-49) and in Uttar Dinajpur, the figure is even more alarming satisfying by only <15% of cohort population (Fig.2 and 3). Maternal health care package of ANC is the main programme of NRHM (2005-'12) to strengthen RCH care. ANC is provided by a doctor, Auxiliary Nurse Midwives (ANM) or other health professional comprises of physical checkups, examination of position and growth of foetus and giving Tetanus Toxoid injection (TT) at periodic intervals during the time of pregnancy. The situation of the said districts in these contradictory ambiences draws our attention towards the prevailing socio-economic status and level of awareness regarding maternal and reproductive health of the districts, as well as of the State.

Socio-economic Status and Level of Awareness

In the study %ages of SCs, STs and Muslim population

have been taken into account as they are considered to be a part of deprived section of the society. Regardless of a half century of legislation and confirmatory action programs, poverty is still higher among the Scheduled population than the non-Scheduled (Gang et al. 2002). The locational concentration of Muslim is high in the districts like- Birbhum, Murshidabad, Maldah, Koch Bihar and Uttar Dinajpur occupying the first raw in the index (Fig. 4), screening the excessive vulnerable outcome of maternal and reproductive health (Fig. 5). The situation of continuous violence, disadvantages, and discrimination endured by the deprived sections of the community is bound to have an adverse impact on their health and their level of awareness to it (Dommaraj, Agadjania, & Yabiku, 2008). The situation can be perceived from the picture of correlation between inter-district socio-economic status and the level of awareness regarding maternal and reproductive health which is showing a sharp positive co-linearity up to (o.852) explaining the system around 68.2% (Fig. 6 and 7).

All societies limit and enhance fertility as a result of customary restrictions on marriage and sexual behaviour. It again depends on the number of children a women have, family size, socio-economic status, religious beliefs, taboos and customs (Frank, 1987). Researchers of racial and ethnic health disparities have noted several impediments in access and utilization of health services for members of historically disadvantaged groups (Frisbie et al. 2004; Burgard 2002; Williams and Collins 1995; Hummer 1993). Even when health facilities are present in the community; discrimination by the provider would significantly limit the usage of those facilities for the ignorant section of the society. The situation is getting reflected from Fig.7, which is showing a positive incident of occurrences up to (0.59) between socio-economic status and maternal health service facility prevalence (Fig. 8 and 9). In case of socio-economic status index Purulia (19), Maldah (18), Bankura (17) and Birbhum (16) rank lowest and convincingly the higher positional perspectives are getting reflected from Kolkata (1st), Haora (2nd), Barddhaman (3rd) and Hugli (4th). A major concern in maternal health is early marriage and early childbearing behaviour (Khadr, 2009). That's why it has been taken as a major component in identification of the awareness status related to the maternal and reproductive health in West Bengal (Fig. 10). An integrated agenda of NRHM is to promote awareness and knowledge of RTIs / STIs as well as HIV/AIDS and to make health facilities accessible for diagnosis and treatment seeking to ensure healthy sexual life, free from fatal infection. One of the responsibilities of health personnel is to provide correct knowledge about reproductive tract infections (RTIs)/ STIs, HIV/AIDS and to encourage the related preventions and treatments. The districts which are in a stumpy position are Bankura (13.9%), Maldah (14%) and Purulia (15.6%) in comparison to the state's average (23.8%) regarding %age of unmarried women belonging to reproductive age group (15-49) having knowledge about emergency contraception. The situation is even worst for Uttar Dinajpur (9.8%) and Koch Bihar (10%). The picture in terms of the level of awareness amongst the married women belonging to the reproductive age group is as gloomy as it is in case of unmarried women's perception status (Fig. 11). Here, in rural areas of West Bengal, relatives/friends are the major sources of RTIs / STIs information (58.4%). The other sources from where women have heard about RTIs/STIs are television (32.3 %), health personnel (21.9 %), radio (14 %), print media (12.8 %), husbands (6.6 %) and leaders/community meetings (1.8 %) (DLHS-3, 2010). The most important aspects which enhance the above districts' position in the vulnerability index of pregnancy outcome are (a) %age of girls marrying before 18 years of age and (b) delivery complication. Like for Murshidabad, Birbhum and Purulia the %age of girls marrying before 18 years of age are respectively-61.6%, 57.4% and 51.9% where in West Bengal the average is 41.3%. Around 88.1%, 76.5%, 74.4%, 85.1% and 82.4% of the cohort population suffering from complications during pregnancy in Birbhum, Koch Bihar, Maldah, Paschim and Purba Medinipur respectively. The picture is quite gloomy in comparison to the state's average (73.6%) of the target group.

Progress Scenario regarding MDG-5 Indicators

To assess the district wise status of maternal health in West Bengal, different parameters have been taken for standardisation along with principal component analysis. All these factors are related to the 'Target 5-A' and '5-B' of the Millennium Development Goals (MDGs, 2000) established by United Nation (Lule E.,et al, 2005). Following variables are selected to identify the status of MDG-5 goal (Improve Maternal Health).V1= percentage of Eligible Couple using any Family Planning Method, V2= percentage of Women Received at least 3ANC, V3=percentage of Institutional Delivery, V4=percentage of Unmet Need for Family Planning.The maximum improvement has been revealed in Darjiling district between the two survey years holding first rank. The district seems to have the total score of -0.97 in DLHS-2 which has increased up to 3.93. On the other hand Birbhum district has shown minimum level of progress (18th rank) within this same time frame. Having the score of 0.07 during DLHS-2, Birbhum has increased only up to 0.68 during the last DLHS (Fig. 12, 13 and 14). Purulia, Bankura and Maldah are lying in the position of 15, 14 and 12 respectively regarding the evidence of positive change from MDG-2 status to MDG-3 status. These districts are really craving for a further investigation.

Analysis of MDG-5 Status through PCA

From the above discussion, it is clear that the inter-

district maternal health status of West Bengal is getting influenced by the prevailing socio-economic circumstances, level of awareness regarding reproductive and maternal health and contraceptive prevalence rate. The four major indicators of the MDG-5 (Improving Maternal Health) goal are showing a distressing condition mostly in the districts of *Rarh Bengal* region. The overall maternal health status is vulnerable in Paschim Medinipur, Koch Bihar and Murshidabad holding the ranks of first, second and third respectively followed by Birbhum (4th) and Maldah (5th). In this maternal health system, delivery and delivery related complications have played a major role along with lack of institutional delivery and lacking in ANC coverage. So to judge the controlling factors of this system of maternal health a multivariate analysis is necessary. That's why Principal Component Analysis (PCA) has been applied here to identify the explained variability and controlling factors of the system of maternal health status in West Bengal.

Rationale behind Selection of Variables for PCA

Same variables have been taken in to account to indentify the controlling factor and composite score index of MDG-5 as in DLHS-2 and 3. After calculating the Principal Component loadings up to three stages of PCA analysis, the Prinsscore has been calculated based on the first principal component of each variable. The following formula has been taken into consideration to calculate the Prinsscore —

$$Pi = \{(V1.v1)+(V2.v2)+....+(Vn.vn)\}/\sqrt{InitialEigenValue}$$

Where,
V1, V2,.....Vn = Actual values of variables
v1, v2, ...vn = Loadings from first principal component of each variables (Eigen Vectors)

Reflections from PCA

(a) MGD-5 Status (DLHS-2)

In this first stage of analysis %age of institutional delivery has been considered to be a controlling factor. The PCA has been done up to three stages. All the variables are seems to be correlated with each other positively and negatively (Table - 2). The correlation between %age of institutional delivery and ANC is high (0.78) where as %age of unmet need for family planning factor having negative correlation with all the other factors (Table - 1). In West Bengal, currently married women physiologically fertile for conceiving and who want more children after two or more years are considered to have unmet need for family planning. It is highest in Uttar Dinajpur (20.3%) and lowest in Barddhaman and Nadia (6.1%). In the first stage of PCA analysis, 78.36% has been explained where %age of institutional delivery (0.93) and %age of unmet need for family planning (-0.92) become the controlling factor for the system positively and negatively respectively (Table - 2). In the second stage of PCA, 95.15 % has been explained with %age of received at least three ANC (0.61) as a dominant factor.

(b) MGD-5 Status (DLHS-3)

In this stage of analysis percentage of unmet need for family planning (-0.93) become the governing factor of the system. It is still highest in Uttar Dinajpur (19.6%) and the lowest status has been shifted to Kolkata (7.3%). After running the PCA up to three stages the correlation matrix shows an astonishing view. Here the family planning method and unmet need for family planning both seem to have low to negative correlation with other variables (Table- 3). In the first stage of PCA 68.18 % has got explained where %age of unmet need for family planning become the guiding factor negatively (-0.91), on the other hand %age of eligible couple using family planning method (0.85) and %age of institutional delivery (0.84) are controlling the system positively (Table - 4). In the next level, 91.59% of the system got explained where at least three ANC became the controlling factor (0.65) and surprisingly the %age of eligible couple using family planning method runs the system negatively (-0.49) shifted from the high positive influence (0.85) on the first stage of PCA analysis (Table - 4.).

(c) Spatial Dimension from Prinsscore of MDG-5 Status (DLHS-2 and 3)

Spatial dimension of the MDG-5 status can be perceived from the prinsscore extraction values. It is evident from the Fig. 15, that the districts with lowest socio-economic status response negatively in both stage of analysis for DLHS-2 and 3 like- Bankura, Birbhum, Maldah, Purulia and Uttar Dinajpur. Another important factor is the higher %age of unmet need for family planning response even more negatively in DLHS-3 prinsscore analysis, like-Uttar Dinajpur (19.6%), Purulia (17.10%) and Maldah (18.3%). The contraceptive prevalence rate is associated with the unmet need for family planning method. The districts which pose higher rank in contraceptive prevalence rate index having lower need for family planning like-Hugli, Kolkata (Fig. 16).

(d) Pregnancy and Maternal Health

Following variables are selected to identify the status of vulnerability in the maternal and reproductive health outcome. Proportion of married women belonging to reproductive age group (15 - 44) have experienced —

V1= Still Birth
V2=Spontaneous Abortion
V3 =Complications during Pregnancy
V4= Complications during Delivery
V5= Post Delivery Complications

In this context, some other social parameters could have been included but here we have considered those parameters which have direct influence on the

reproductive and maternal health outcome. Although accurate data on pregnancy wastage and child mortality are still lacking in India, yet it has been estimated that loss of human life in terms of total wastage of pregnancies (abortions and stillbirths) and infant as well as child mortality probably are highest in the world ((Lule, Ramana, Ooman, Epp, Huntington, & Rosen, 2005). This tremendous wastage of human resource caused by the neonatal deaths and still births are considered to be a problem, widely prevalent in developing countries especially, in India, Pakistan and Bangladesh (Sidhu, 1994) ,affecting the mothers' health and her socio-emotional bondage. High rate of pregnancy wastage, infant and child mortality shape the parents' attitudes towards a controlled family size or adopting the birth control measures. It is therefore an important parameter to be considered to arrive at the accurate estimation of vulnerable maternal and reproductive health outcome considering wastage of pregnancies through abortions and stillbirths.

To identify the controlling factor for the vulnerable outcome of maternal health principal component analysis has been done up to three stages. Before that, from the correlation matrix it is evident all the factors are correlated with each other on a low to moderate 'r' status and none of the factor is getting the dominant position here (Table - 5). To avoid the nuisance, the principal factor has been extracted from the PCA. In the first stage, only 34.23 % of the system got explained where spontaneous abortion (-0.71) and post delivery complication (0.88) become the controlling factor of the system in both negative and positive direction respectively (Table-6). On the second stage of component analysis, 65.27% got explained and the governing factorial status has been shifted to delivery complication (0.65). The whole system got explained around 83.26% in its third stage of analysis, where the controlling factor is complications during pregnancy (0.62) (Table- 6).

Spatial Dimension of Vulnerability of Pregnancy and Maternal Health

To assess the position of the districts of West Bengal in this vulnerable outcome status prinsscore 1 and 2 has been calculated taking the PCA eigen values of first two stages, which are -1.71 and 1.55 (Table - 6). After this the positional aspect of the district has been identified through Quadrant Analysis. It is evident from the quadrant analysis that there are basically three clusters of districts. Surprisingly the districts of Nadia, Jalpaiguri, Purulia, Bankura and Dakshin Dinajpur are in the safe co-ordinate (-,-) of the quadrant as these districts have scored lower value in the two stages of component analysis and also holds the rank of 16,18,11,13 and 19 respectively in the composite score index which implies that these districts are not suffering from the distressful pregnancy outcome. In case of Uttar Dinajpur, Murshidabad and Koch Bihar delivery related complications are playing a major role as these districts hold the negative position in the second prinsscore (+,-) analysis, governing by the second stage of PCA eigen values and dominant factors (Table - 6). The position of Hoara, Hugli, Barddhaman and N-24 Paraganas have improved in the second prinsscore, lying in the (-, + coordinate). The safest positions in this quadrant have been shared by Kolkata and Darjiling. But the districts like- Paschim Medinipur, Maldah and Birbhum don't fall in any of the clusters which could accomplish their position in the quadrant. Here Birbhum has occupied the most alarming position as the district has scored high value in both the stages of prinsscore analysis. As here we are concerning with the vulnerability status of pregnancy outcome high value indicating towards the higher distressing conditions prevailing in the district (Fig. 17). Fig. 18 shows the concentration status of vulnerability regarding maternal health outcome being shared by the district of Birbhum, Murshidabad , Maldah and Uttar Dinajpur scoring a value >1. Kolkata is in the safest position.

Conclusion

Basically, different parameters are guiding the maternal health system of West Bengal where different districts are responding in a different way. Coming to conclusion the maternal health status of the districts of *Rarh Bengal* region along with Nadia, Haora and Uttar Dinajpur are getting influenced by the unmet need for family planning but the situation is different for Birbhum, Maldah and Murshidabad, as these are suffering both by the unmet need for family planning and lack of institutional delivery. This is the basic reason behind their lower position in MDG-5 status index. On the other hand, delivery and post delivery complication are the major governing factors for vulnerability index of pregnancy outcome. Birbhum, Koch Bihar, Murshidabad and Malda have occupied the first row of the index. The probable reason behind this picture is that the districts are having maximum %age of Muslim community. The muslims are governing by different kinds of taboo related to maternal health. “The observed differential may be due to differences in socio-economic characteristics (known as characteristics hypothesis) or because of the theological prescriptions on demographic parameters (known as particularized theology hypothesis or 'pure religion' effect) (Ram, Dwivedi, & Goswami, 2007)”.

Sometimes, its become hard to convince them to adopt the modern medical infrastructure during the time of pregnancy according to the officials of CMOH, Birbhum. In most cases they opt for the home delivery over the institutional delivery (Table- 7). It is interesting to note that utilization of ANC and health infrastructure (Map-1) are quite satisfactory in these districts, yet institutional deliveries are not common practice. That's why delivery and post delivery complications become the main controlling factor for the vulnerable pregnancy

and maternal health outcome for the districts. To improve maternal health status of West Bengal, we should focus on these districts where maternal health is in a frightful condition. Initiatives should be taken to improve the maternal health status of these districts to accomplish the 'Target-5'of millennium development goals by the year 2015.

References

1. Dommaraj, P., Agadjania, V., & Yabiku, S. (2008). The Pervasive and Persistent Influence of Caste on Child Mortality in India. *Population Research and Policy , 27* (4), 477-495. Retrieved on August 3, 2014 from http://download.springer.com/static/pdf
2. Fischer, M. G. (2012). *Maternal Health:White paper.* New York: World Youth Alliance. Retrieved on August 5, 2014 from "www.wya.net/advocacy/research/WYA%20maternal%20health%20white%20paper.pdf" http://www.wya.net/advocacy/research/
3. Frank, O. (1987). The Demand for Fertility Control in sub-Saharan Africa. *Studies in Family Planning, , 18* (4). Retrieved on September 23, 2014 from www.Jstor.org/action/ Demand for Fertility Control.pdf
4. George, W., & Anderson, M. D. (ed). *Research in Reproductive Wastage.* American Journal of Public Health. Retrieved on October 5, 2014 fromwww.ncbi.nlm.nih.gov/pmc/articles/PMC1551434/pdf/amjphnation01095-0095.pdf" http://www.ncbi.nlm.nih.gov/ 01095-0095.pdf
5. Khadr, Z. (2009). Monitoring socioeconomic inequity in maternal health indicators in Egypt: 1995-2005. *International Journal for Equity in Health , 8* (38), 3-12. Retrieved on November 21, 2014 from www. jstor.org/ Monitoring socioeconomic inequity in maternal health indicators.pdf
6. Ram, U., Dwivedi, L. K., & Goswami, B. (2007). Understanding Contraception Use among Muslims of India, Pakistan and Bangladesh. *Journal of Population and Social Studies , 15* (2). Retrieved on September 8, 2014 from http://paa2007.princeton.edu/abstracts/71276
7. Sidhu, S. (1994). Pregnancy wastage in two tribal communities : (Gujars and Bazigars) of Punjab, India. *Anthropologischer Anzeiger*,137-142. Retrieved on December 15, 2014 from http://www.jstor.org/action/
8. Triveni, B. S., Bhojani, U., Mishra, A., Amruthavalli, Devadasan, R., & Munegowda, C. M. (2012). Health system challenges in delivering maternal health care: evidence from a poor urban neighbourhood in South India. *BMC Proceedings* , 13. Retrieved on September 14, 2014 from www.rchiips.org/pdf/ www.jstor.org/action/wb.pdf
9. *Webster's New World Medical Dictionary* (3rd ed.).(W. C. Shiel, Ed.) New Jersey, Hoboken: Wiley Publishing, Inc. ISBN: 978-0-470-18928-3. Retrieved on August 28, 2014 from www.cao.ir/portal/File/ShowFile.aspx?ID=ad6bdee4-5a38-4822-9514-1e0be1062c28

Reports

10. *Assessment of Janani Surksha Yojona in West Bengal*(2007). Center for Operations Research and Training (CORT). Vadodora. Retrieved on September 10, 2014 from http://www.cortindia.in/RP\RP-2007-0503.pdf
11. Lule, E., Ramana, G. N., Ooman, N., Epp, J., Rosen, J. E., & Huntington, D. (2005). *Achieving the Millennium Development Goal of improving Maternal Health:Determinants, interventions and challenges* . Health, Nutrition and Population. The World Bank. New York, Washington, DC. Retrieved on August 18 from http://siteresources.worldbank.org/MDGFinal.pdf
12. *Millennium Development Goals Indian Country Report (2014)* . India. Central Statistical Organization, Ministry of Statistics and Programme Implementation, Government of India. New Delhi. Retrieved on September 5, 2014 from HYPERLINK "http://endpoverty2015.org/wp-content/uploads/2014/07/MDG%20Report%202014%20English.pdf" http://endpoverty2015.org/wp-content/
13. Shekhar, C., Ram, F., Ladusingh, L., Paswan, B., Unisa, S., Prasad, R., et al. (2010). *District Level Household and Facility Survey,2007-08.* New Delhi: Ministry of Health and Family Welfare. Retrieved on August 3, 2014 from www.rchiips.org/pdf/rch3/report/wb.pdf" www.rchiips.org/pdf/rch3/report/wb.pdf
14. Ranjan, R., Lakhara, K. C., Prasad, M. N., Wankhede, A. N., Sonkamble, U. J., Kumar, A., et al. (2004). *Reproductive and Child Health, District Level Family and Household Survey.* New Delhi: Ministry of Health and Family Welfare. Retrieved on August 3, 2014 from www.rchiips.org/pdf/state/WestBengal.pdf" www.rchiips.org/pdf/state/WestBengal.pdf
15. *Census of India (2011)*. Ministry of Home Affairs. Govt. of India: Office of the Registrar General & Census Commissioner, India*17.District Statistical Handbook, Birbhum (2011)*. Bureau of Applied Economics and Statistics. Department of Statistics and Programme Implementation. Govt. of West Bengal. Kolkata

Table- 1: MGD-5 Status during DLHS-2
(Pearson's Product Moment Correlation Matrix)

Variables	Women & Husband using any Family planning Method (%)	Women Received at least 3 ANC (%)	Institutional Delivery (%)	Unmet Need for Family Planning (%)
Women & Husband using any Family Planning Method (%)	1	0.51	0.75	-0.95
Women Received at least 3 ANC (%)		1	0.78	-0.49
Institutional Delivery (%)			1	-0.76
Unmet Need for Family Planning (%)				1

Source: Computed by the authors

Table- 2: MGD-5 Status during DLHS-2
Extraction of Principal Components with Cumulative % of Variance (Harold Hotelling, 1930)

PCA	Initial Eigen Values	Cumulative % of Variance	Women & Husband using any Family Planning Method (%)	Women Received at least 3 ANC (%)	Institutional Delivery (%)	Unmet Need for Family Planning (%)
1	3.13	78.36	0.92	0.77	0.93	-0.92
2	0.67	95.15	-0.35	0.61	0.20	0.37
3	0.15	98.84	-0.11	-0.19	0.31	0.04

Source: Computed by the authors

Table- 3: MGD-5 Status during DLHS-2
(Pearson's Product Moment Correlation Matrix)

Variables	Women & Husband using any Family Planning Method (%)	Women Received at least 3 ANC (%)	Institutional Delivery (%)	Unmet Need for Family Planning (%)
Women & Husband using any Family Planning Method (%)	1	0.28	0.52	-0.93
Women Received at least 3 ANC (%)		1	0.69	-0.41
Institutional Delivery (%)			1	-0.59
Unmet Need for Family Planning (%)				1

Source: Computed by the authors

Table- 4: MGD-5 Status during DLHS-3
Extraction of Principal Components with Cumulative %ages of Variance (Harold Hotelling, 1930)

PCA	Initial Eigen Values	Cumulative % of Variance	Women & Husband using any Family Planning Method (%)	Women Received at least 3 ANC (%)	Institutional Delivery (%)	Unmet Need for Family Planning (%)
1	2.73	68.18	0.85	0.69	0.84	-0.91
2	0.94	91.59	-0.49	0.65	0.36	0.37
3	0.28	98.48	-0.05	-0.31	0.41	0.09

Source: Computed by the authors

Table - 5: Vulnerable Outcome of Pregnancy and Maternal Health
(Pearson's Product Moment Correlation Matrix)

Variables	Still Birth	Spontaneous Abortion	Complications During Pregnancy	Delivery Complications	Post Delivery Complications
Still Birth	1	-0.30	-0.22	-0.39	0.11
Spontaneous Abortion		1	-0.04	-0.09	-0.49
Complications During Pregnancy			1	0.15	0.40
Delivery Complications				1	0.12
Post Delivery Complications					1

Source: Computed by the authors

Table - 6: Vulnerable Outcome of Pregnancy and Maternal Health
Extraction of Principal Components with Cumulative %ages of Variance (Harold Hotelling, 1930)

PCA	Initial Eigen Values	Cumulative % of Variance	Still Birth	Spontaneous Abortion	Complications During Pregnancy	Delivery Complications	Post Delivery Complications
1	1.71	34.23	0.08	-0.71	0.57	0.32	0.88
2	1.55	65.27	-0.88	0.42	0.43	0.65	-0.09
3	0.90	83.26	0.03	0.38	0.62	-0.59	0.12

Source: Computed by the authors

Table - 7: Proportions of Institutional Delivery (for Selected Districts)

Districts	%
Birbhum	48.70
Maldah	28.50
Murshidabad	41.60
WEST BENGAL	49.1

Source: District Health and Family Welfare-3, 2010

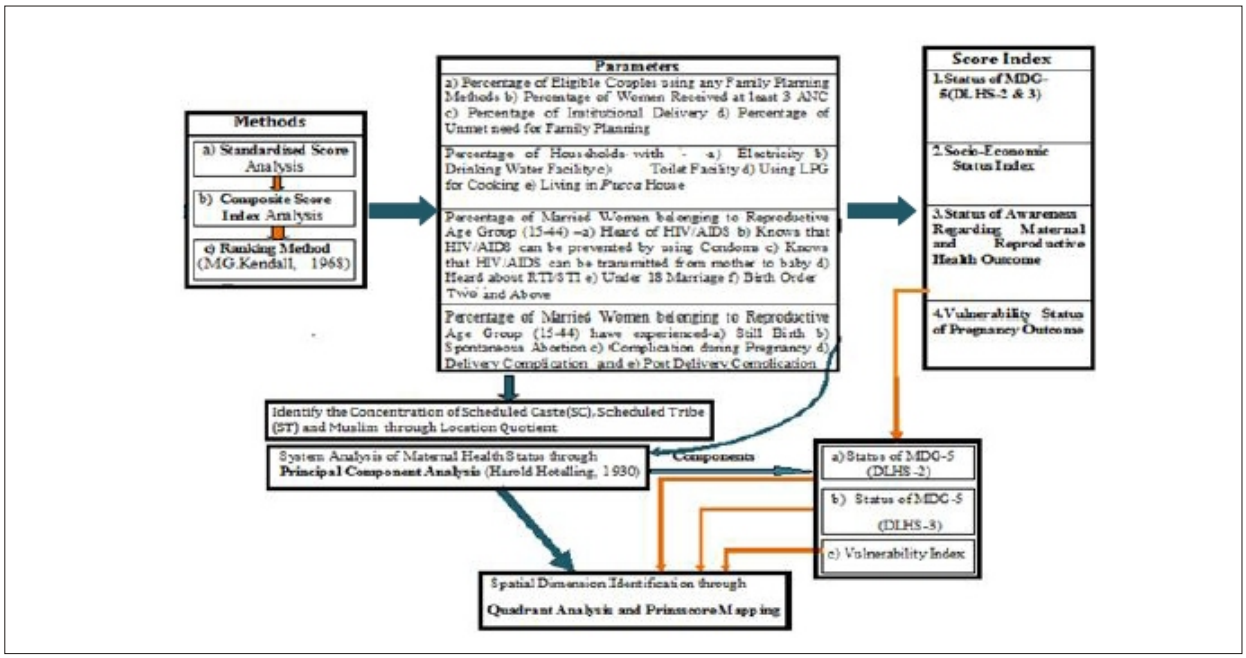

Fig. 1: Flowchart of Methodology

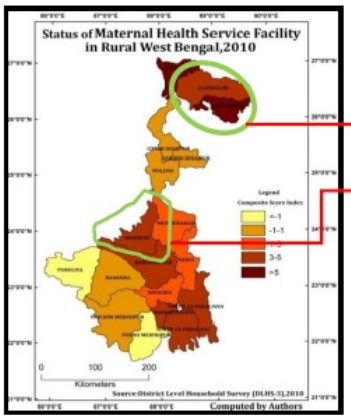

Fig. 2: Status of MHSF, W.B.(2010)

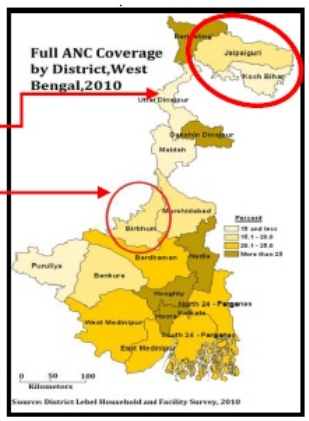

Fig. 3: Status of ANC Coverage, W.B.(2010)

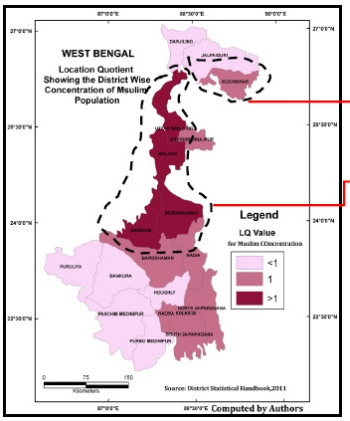

Fig. 4: Concentration of Muslim Population, W.B.(2011)

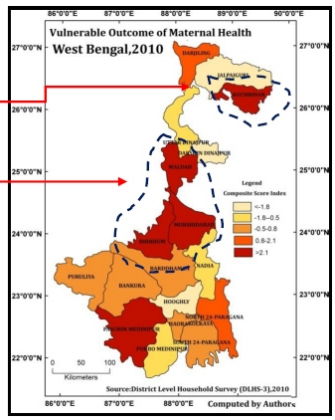

Fig. 5: Vulnerable Outcome of Maternal Health , W.B.(2011)

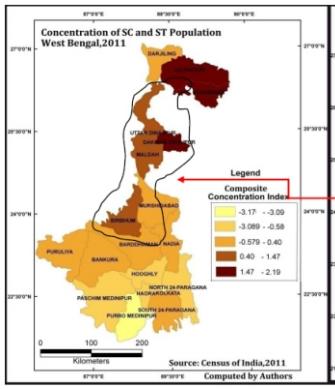

Fig. 6: Concentration of SC/ST Population, W.B.(2011)

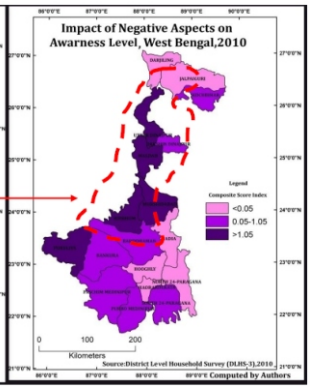

Fig. 7: Negative Impact of Awareness Level , W.B.(2011)

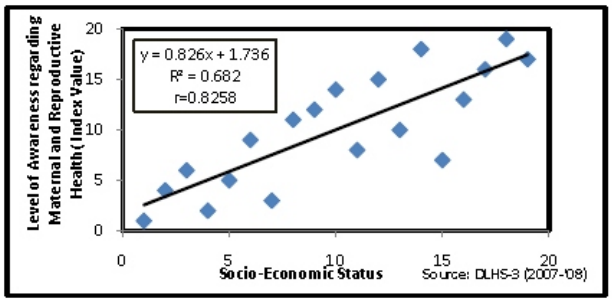

Fig. 8: Relationship between Socio-economic Status and Awareness Level

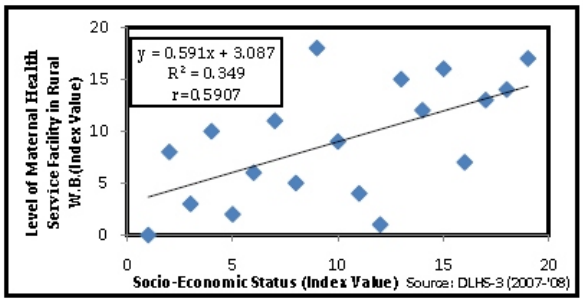

Fig. 9: Relationship between Socio-economic Status and Maternal Health Service Facility

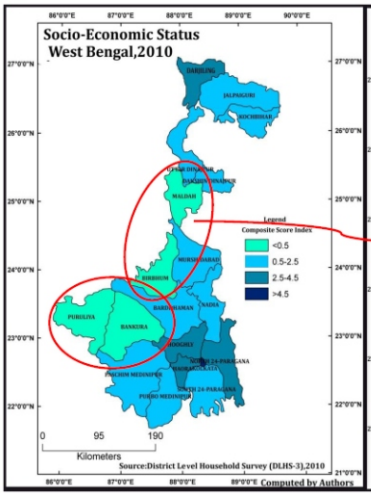

Fig. 10: Socio-economic Status, W.B.(2010)

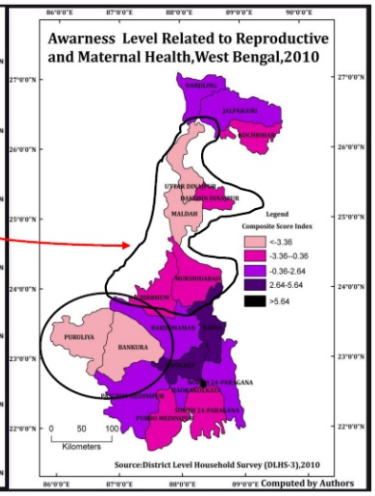

Fig. 11: Awareness Level , W.B.(2011)

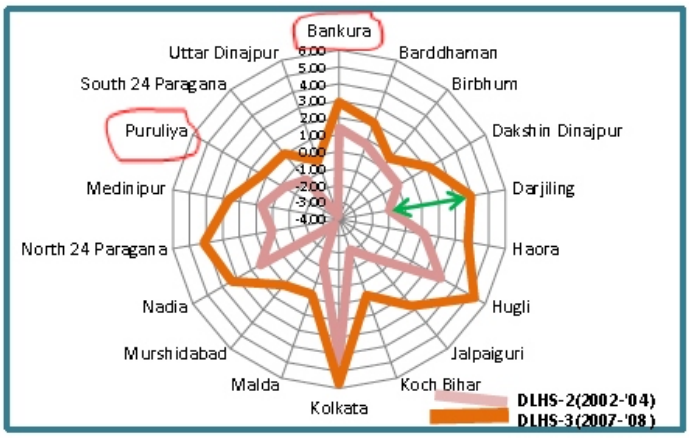

Fig. 12: Positive Changes in MDG-5 Status from DLHS-2

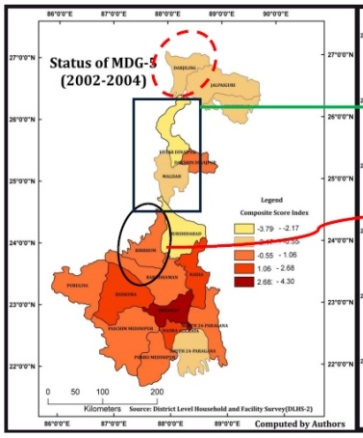

Fig. 13: Status of MDG-5, W.B. (DLHS-2, 2002-'04)

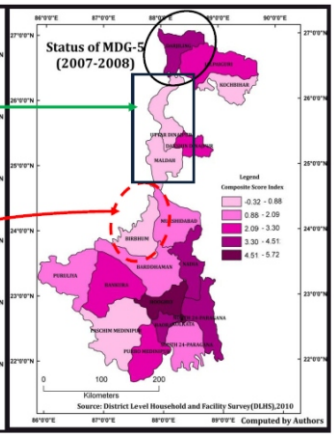

Fig.14: Status of MDG-5, W.B. (DLHS-3, 2007-'08)

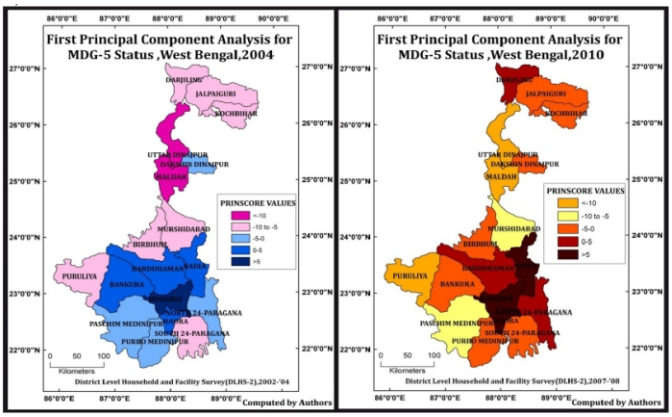

Fig. 15: Spatial Dimension of MDG-5 Status, W.B. (DLHS-2)

Fig.16: Spatial Dimension of MDG-5 Status, W.B. (DLHS-3)

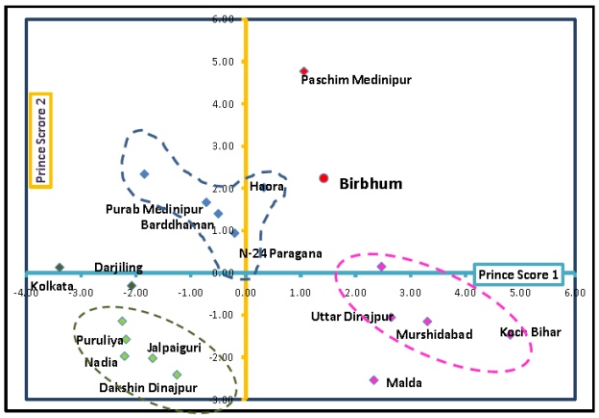

Fig.1 7: Vulnerability Index of Pregnancy and Maternal Health Outcome (Quadrant Positional Analysis)

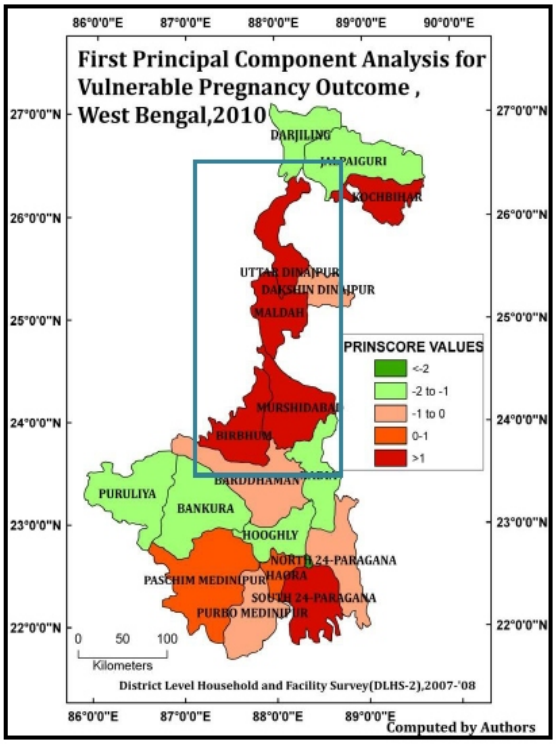

Fig. 18: Spatial Dimension of Vulnerable Pregnancy Outcome, W.B. (2010)

Alokananda Ghosh
Research Scholar
Department of Geography
University of Burdwan
Email: alokanandaghosh04@gmail.com

Dr. Biswaranjan Mistri
Assistant Professor of Geography
University of Burdwan
Email: brmistri@gmail.com