

Household Costs of Obtaining Maternal and Newborn Care in Rural Bangladesh: Baseline Survey

Mohammad Nasir Uddin Khan¹
Zahidul Quayyum²
Hashima-E-Nasreen¹
Tim Ensor²
Sarah Salahuddin¹

*¹BRAC Research and Evaluation Division, Bangladesh;
²University of Aberdeen, UK
E-mail: nasir.uk@brac.net*

December 2009

Research Monograph Series No. 43

Research and Evaluation Division, BRAC, 75 Mohakhali, Dhaka 1212, Bangladesh
Telephone: 88-02-9881265-72, 8824180-7 (PABX) Fax: 88-02-8823542, 8823614
Website: www.brac.net/research

Copyright © 2009 BRAC

December 2009

Cover design
Sajedur Rahman

Printing and publication
Altamas Pasha

Design and Layout
Md. Akram Hossain

Published by:

BRAC
BRAC Centre
75 Mohakhali
Dhaka 1212, Bangladesh
Telephone: (88-02) 9881265, 8824180-87
Fax: (88-02) 8823542, 8823614
Website: www.brac.net/research

and

Ipact
University of Aberdeen
Health Sciences Building Foresterhill
Aberdeen AB25 2ZD
United Kingdom
Phone : +44(0) 1224 551897
Fax : +44(0) 1224 555704
E-mail : info@ipact-int.com

BRAC/RED publishes research reports, scientific papers, monographs, working papers, research compendium in Bangla (*Nirjash*), proceedings, manuals, and other publications on subjects relating to poverty, social development, health, nutrition, education, gender, environment, and governance.

Printed by BRAC Printers, 87-88 (old) 41 (new), Block C, Tongi Industrial Area, Gazipur, Bangladesh

TABLE OF CONTENTS

List of tables	iv
List of figures	iv
Abbreviations	v
Acknowledgements	vi
Abstract	vii
Executive summary	viii
Introduction	1
Objective	2
Methods	3
Findings	6
Socioeconomic characteristics	6
Utilization and cost of obstetric care	9
Utilization and cost of ANC	9
Utilization and cost of delivery care	10
Source of financing for delivery care	13
Reasons for not using skilled care	15
Cost of newborn and post-natal care	16
Total cost of obstetric care for the households	16
Poverty impact or catastrophic payments due to obstetric and neonatal care	18
Distribution of households with catastrophic payment	18
Assessing progressively of out-of-pocket payment	19
Discussion	21
Policy implications	24
References	25
Appendix	28
Appendix table	28
Appendix figure	33
Appendix map	36
Appendix note	37

List of Tables

- Table 1. Study sample
- Table 2. Respondents', and households' characteristics (%)
- Table 3. Pattern of household expenditure by socioeconomic status
- Table 4. District-wise distribution of households by income quintiles
- Table 5. Cost of antenatal care to the households
- Table 6. Cost of delivery care to the households
- Table 7. Median amount of borrowing during recent delivery
- Table 8. Preferred provider and place of delivery care with their anticipated costs
- Table 9. Total costs of obstetric care
- Table 10. Households facing catastrophic effects of payments for delivery care
- Table 11. Kakwani index of out-of-pocket payment for delivery care

List of Figures

- Figure 1. Inequality in use of place of delivery
- Figure 2. Source of finance for delivery care
- Figure 3. Reasons behind not using skilled birth attendant

ABBREVIATIONS

ANC	Antenatal Care
BHP	BRAC Health Programme
CI	Concentration Index
CS	Caesarean Section
DED	Deputy Executive Director
EmOC	Emergency Obstetric Care
FWA	Family Welfare Assistant
FWC	Family Welfare Center
FWV	Family Welfare Visitor
MCWC	Maternal and Child Welfare Centre
MDG	Millennium Development Goals
MNCH	Maternal, Neonatal and Child Health
PNC	Post-natal Care
RED	Research and Evaluation Division
SK	<i>Shasthya Karmi</i>
SS	<i>Shasthya Shebika</i>
TBA	Traditional Birth Attendant
TTBA	Trained Traditional Birth Attendant

ACKNOWLEDGEMENTS

First and foremost we would like to express our deepest gratitude to Dr. Imran Matin, Deputy Executive Director, BRAC International and Dr. SM Ziauddin Hyder, former Director, Research and Evaluation Division (RED) for their support and cooperation. The authors would also like to thank Dr. Syed Masud Ahmed, Research Coordinator of BRAC RED for his valuable feedback. We are thankful to Mr. Faruque Ahmed, Director, BRAC Health Programme (BHP) deserves thanks in this regard and particularly Dr. Kaosar Afsana, Associate Director, BHP helped us immensely. We are also grateful to Dr Margaret Leppard, consultant of University of Aberdeen for her editorial support. We gratefully acknowledge the contribution of Dr. Jahangir AM Khan, health economist, in Health System and Infectious Diseases Division, ICDDR,B for reviewing the manuscript. Sincere thanks to Mr. Hasan Shareef Ahmed for editing the manuscript. We are also indebted to Mr. Syed Suaib Ahmed for logistic and management support. Finally, we would like to thank to the respondents and other participants in the study area for their assistance and valuable time to provide the information on what the study is standing on.

The Research and Evaluation Division (RED) is supported by BRAC's core funds and funds from donor agencies, organizations and governments worldwide. Current major donors of BRAC and RED include Aga Khan Foundation Canada, AusAID, Campaign for Popular Education, Canadian International Development Agency, Department for International Development (DFID) of UK, European Commission, Fidelis France, The Global Fund, Government of Bangladesh, Institute of Development Studies (Sussex, UK), Inter-cooperation Bangladesh, Land O Lakes (USA), Scojo Foundation Incorporation, NORAD, NOVIB, OXFAM - America, Plan International Bangladesh, The Population Council (USA), Rockefeller Foundation, Rotary International, EKN, Save the Children (UK), Save the Children (USA), Stanford University, Swiss Development Cooperation, UNICEF, World Bank, World Food Programme, Family Health International, Oxford University, DIMAGI, AIDA, BRAC-USA, Manusher Jonno Foundation, Bill and Melinda Gates Foundation, University of Leeds, Micronutrient Initiative, ICDDR,B, Emory University, Hospital for Sick Children, Karolinska University, GTZ and AED ARTS.

ABSTRACT

The costs of skilled maternal and newborn care are major obstacles to access. This cross-sectional study of 1,200 married women, who had a live birth in the previous year, analyzed the costs incurred by a household for maternal and newborn care in selected areas of rural Bangladesh. In Nilphamari since most mothers enjoy free ANC services from BRAC *Shasthya Karmis*, there was higher utilization with zero cost to households. Utilization of home delivery by unskilled providers is pro-poor, while public and private facilities are largely utilized by richer households. Costs of delivery care varied considerably by type of treatment and place of delivery. Out-of pocket spending was a major source for delivery care whilst spending out of savings was higher in Nilphamari. Cost as a barrier to seeking skilled delivery care was reported by more mothers in areas where BRAC MNCH interventions are not in place. Mothers who did not obtain delivery care from skilled attendants or facilities reported preferring public facilities if affordable and their anticipated cost at their preferred place was higher than those who have actually used those facilities. The number of households with catastrophic expenditure for obstetric care is quite low as most home deliveries and unskilled care attendants had a low level of payment. If mothers have at least three ANC visits and obtain skilled delivery care from a facility the number of households making catastrophic payments would be higher. Attempts should be made to encourage able households to save for obstetric care. Informing them of the fee charged can help mothers to form a correct impression of the total costs of skilled care. Reducing the cost of obtaining obstetric care, particularly for the poor, can help to increase the utilization of skilled care. Extreme poor households will continue to need financial support.

EXECUTIVE SUMMARY

BRAC, through Maternal, Neonatal and Child Health (MNCH) programme, has undertaken efforts to reduce maternal death by improving maternal services. This study comprises a baseline assessment of levels of household costs for maternal and neonatal health services in the proposed intervention and comparison area of the MNCH Project. A cross-sectional survey of married women of reproductive age (15-49) in 1,200 households was conducted through a quantitative survey by BRAC RED during February 2009. These women had a live birth one year before the interview. The study area includes Nilphamari as pilot intervention, Rangpur, Gaibandha, Mymensingh as proposed intervention and Naogaon, Netrakona as comparison area. These 1,200 mothers were one-third mothers of sample of the main 'MNCH baseline survey-2008' which had 600 respondents from each district having a child less than one year of age.

Findings from this study suggest that a higher proportion of mothers in Nilphamari sought antenatal care (ANC) whereas *Shasthay Karmi*¹ (SK) took a significant role as provider of the services. The median costs to households for last ANC visit were higher in the comparison areas (Tk. 300) and the proposed intervention areas (Tk. 200), and the median costs for this service, Nilphamari was found to be zero as most of the mothers enjoying free ANC services through BRAC SKs.

Home delivery dominated in all areas. Accessing skilled provider was higher in Nilphamari may be a result of intervention. Inequality measure using concentration index suggests that there is a disproportionate concentration of mothers in obtaining delivery care at home or use of unskilled providers suggesting utilization of home delivery services and unskilled providers at home are pro-poor. Utilization of public and private facilities is pro-rich. The median cost of delivery care varied considerably by the type of treatment and place of delivery. As expected, mother who had their delivery care at home had lower levels of expenditure than those who used facilities.

Out-of pocket spending was found to be major source for paying for the delivery care for most of the households. Borrowing, using household savings, and financial assistance from relatives were also found to be important in paying for the delivery care. The amount of money borrowed

¹ BRAC community health worker

was higher for Caesarean Section (CS) delivery. About 89% households (216 of who borrowed) had to borrow more than 50% of their delivery care cost.

Mothers who did not have skilled care attendant for delivery care were asked to give reasons for not doing so. The commonly cited reason was that they thought they did not face any life-threatening conditions during delivery. The second most reported reason for not seeking delivery care at the facility or from skilled attendants was that they thought the costs for such care were high and unaffordable. When we asked about their idea about such costs, we found that median level of such anticipated costs were higher than that the median costs for the households who have actually used those skilled providers or facility. Efforts should be made to make the charges more transparent, publicity of charges can help mothers to have the right idea about the amount of money they have to spend. Special effort may be needed to implement this in the public sector facilities.

We found that higher number of households from Naogaon making catastrophic payments; that means a payment was 40% or more than their non-food expenditure. If we do a simulation and estimate total obstetric care in a scenario where all the mothers have at least three ANC visit, and obtain the delivery care from facility, we can see that the overall number of households making catastrophic payments were more for households belonging to lower income quintiles group. Income quintile three in our total population used higher proportion of their income for delivery payment. Payments for home delivery are progressive as they are cheap and mostly are provided by unskilled providers. This is not what is desirable. Out of pocket payment for delivery care is slightly progressive but needs to be more progressive to make a positive impact on maternal and neonatal health outcome.

Reducing cost of obstetric care, particularly for the poor, should be an appropriate measure to increase the utilization of skilled care. Encouraging able households to save for obstetric care, as planned in the intervention, would be useful for even near poor households. Extreme poor households will continue to need financial support. Total cost of package where a mother use the desired level of ANC and delivery care at facility, then on average it would cost Tk. 4,849. This level of cost can be an indication for planning any prepayment mechanism. If mothers use home- based skilled delivery care instead of facility-based care, then this package would cost Tk. 1,303. Mothers, who are not using skilled attendants or facility-based care, need to have proper information about the costs they would face if they want to do so. That will help policy makers to understand what proportion of mothers or families are really taking costs into consideration in deciding to chose skilled or facility-based care.

INTRODUCTION

Skilled attendants at delivery care has been considered as the single most effective means for reducing maternal mortality and morbidity (UNFPA 2007) in low and middle income countries (Richard *et al.* 2009). Most maternal deaths occur in poor countries (Costello *et al.* 2004) and most of these can be attributed to low level of supply and utilization of skilled maternal health services (Rahman and Sarkar 2009).

Studies have suggested that the cost of health services is a major determinant of demand for healthcare, particularly for maternity healthcare (Borghi *et al.* 2006; Hjortsberg 2003). Estimates of out-of-pocket costs for maternity care show that they constitute a significant percentage of household income (Perkins *et al.* 2009). The cost of obtaining skilled obstetric care at a health facility is prohibitively high for many poor households and constitutes a major barrier to increase utilization and access to safe maternal care (Borghi *et al.* 2003, Borghi *et al.* 2006; Ensor and Ronoh 2005). Around 85 % of births in rural Bangladesh takes place at home (NIPORT, Mitra Associates and Macro International Inc. 2007). Home delivery is preferred as it is associated with low cost (Afsana and Rashid 2001) and delivery care at facilities is considered only for emergency obstetric care (EmOC). Notwithstanding their lower levels of utilization, poor households often spend a larger proportion of their income than those who are better-off, and end up making catastrophic payments (O'Donnell *et al.* 2007).

In Bangladesh, the high cost of seeking skilled care for life-threatening complications in pregnancy and pronounced socioeconomic disparities in both urban and rural areas are identified major factors inhibiting the achievement of the Millennium Development Goal (MDG) - 5 that aims at improving maternal health (Koenig *et al.* 2007; Afsana 2004; Goodburn 1995).

NGOs in many countries have been successful in increasing access to essential obstetric care in rural communities and community programmes have been able to generate limited funds to the same end (Borghi J 2001). BRAC, through contributing to the government's effort in achieving MDG 5, is undertaking efforts to reduce households' maternal morbidity and mortality and increase the level of welfare by improving maternal services. BRAC launched the MNCH programme in 2005 in Nilphamari district and scaled up in three more districts in 2008 with the objective of promoting an integrated service approach and community-based solutions to maternal, neonatal and child health problems.

The operational strategies of the project are improvement of service delivery for the maternal, neonatal and child health and strengthening the demand of the community. The major interventions encompass capacity development of community health human resources, empowerment of women and support groups, provision of maternal, neonatal and child health services and development of referral linkages with health facilities providing EmOC. The programme addresses the issue of reaching the poor through healthcare financing measures including providing free care to the hard core poor, creation of funds at the sub-districts level for the poor, and BRAC's safety net measures such as Challenging the Frontiers of Poverty Reduction (CFPR), *Gram Daridro Bimochon Committee* (GDBC). In this context it is important to examine the extent of financial barriers and the costs of obstetric and newborn care of the households at both intervention and comparison areas.

As a part of the research for the monitoring and evaluation of the programme, baseline studies were undertaken to assess the pre-intervention situation of major MNCH indicators that will be re-examined throughout the five years of the programme to assess performance. The baseline study attempts to investigate how different socioeconomic, demographic, and other factors explain the level of utilization of maternal and neonatal health services (antenatal care, delivery care, post natal care and neonatal care) in intervention and control districts of the MNCH programme.

Objective

The main objective of this study was to analyze the costs a household faces in rural Bangladesh while paying for the maternal and neonatal health services.

The specific aims of this paper were:

- To determine how the demand and utilization pattern of MNCH services affects the costs of healthcare to the households,
- To determine the levels of costs to the households for the use maternal and neonatal health services
- To examine the extent and impact of financial barriers on the utilization of services the household is facing.
- To examine the extent of impoverishment for the households due to the expenditure on maternal, and neonatal healthcare
- To examine the equity in financing maternal, neonatal and child healthcare from household perspective

METHODS

Study settings

A cross-sectional study was conducted through a quantitative survey. Data on costs to a mother for maternal health services and cost of care for her newborn were collected. The costs of these services include doctors' fee, medicines and diagnostic tests and transportation to the service centre. Information on household expenditure was also collected. This study is closely linked with the main baseline survey that collected information on socio-demographic characteristics of the households with mothers and their knowledge and practices on family planning, antenatal care, delivery care, post-natal care and neonatal care, and other related issues including immunization, breastfeeding and weaning food for infants. The baseline survey was conducted in rural areas of six northern districts of Bangladesh (Appendix Map 1).

Study population

The survey included married women of reproductive age (15-49 years), who had a live birth in the last one year (a sub-group of the main MNCH baseline survey) (Appendix Fig.1). The study was conducted in six districts where one was in pilot intervention ((Nilphamari) and three were in the proposed programme intervention area (Rangpur, Gaibandha, Mymensingh) and two in comparison areas (Naogaon, Netrakona). Nilphamari was considered as a 'Pilot Intervention' district where some of the intervention activities were in place and the rest three districts are termed as "Baseline proposed intervention". The proposed intervention areas were chosen where the three core programs of BRAC (micro-finance, health including MNCH and education) were in performing. The MNCH interventions do not exist in the comparison areas.

Sampling strategy

The MNCH Baseline Survey consists of 3,600 respondents from six districts of mothers having an under one child. Using systematic sampling, we sampled one-third or 1,200 mothers (Table 1), from the sample frame of 'MNCH Baseline Survey-2008' to include only those mothers who had the most recent birth. It was expected that these mothers would give more precise information regarding their expenditure on delivery care, post-natal and neonatal care. Because of mobility of mothers for several reasons (e.g. visit parent's, or relative's home, or re-

locating themselves), 21 eligible respondents were not available at their homes during the interview period. In such cases, if the field researchers could not find the mothers on their first visit, they made second visit after three days. If she was not available at the second visit, next one from the list with most recent birth was selected. Appendix Table 1 shows the sample for the main baseline survey and the distribution of the mothers selected for households cost survey.

Table 1. Study sample

	Area	District	Baseline survey	Household cost study	Total
Baseline	Comparison	Netrakona	600	200	400
		Naogaon	600	200	
	Proposed intervention	Rangpur	600	200	
		Mymensingh Gaibandha	600	200	600
Nilphamari	Pilot intervention	Nilphamari	600	200	200
Total households			3600	1200	1200

The Questionnaire and data collection

Questionnaire

A structured questionnaire was developed to collect information on the amount of money a household had to spend on delivery services, cost of travel to obtain these services, sources of the funds to pay for delivery care, and reasons for not seeking care from a skilled birth attendant. Information on monthly average expenditure of the household was also collected. Socio-demographic and necessary information was taken from the main baseline survey.

Data collection and quality control

The household cost questionnaire was pre-tested at Gazipur district in January 2009 and revised accordingly. Interviewers were trained at a three-day training session (held during 12-14 January, 2009) including a lecture, role-play and practice session in the field. The costs to the households for the services included the amount of money they spent on travel, fees, drugs and supplies and inpatients days. Information on household expenditure was collected from the sample for this study that included expenditure on food and non-food items based on the major categories used in the Living Standard Measurement Survey (Gertler *et al.* 1988). The interviews were conducted at respondent's homes. In many cases the household head or the person who accompanied the mothers while they obtained delivery care provided the information on the amount

of money spent, and information on household expenditure. Information was linked with the 'MNCH baseline survey-2008' by a unique ID number of the household.

Data were collected during January-February 2009. Twelve teams, each comprising two interviewers were responsible to conduct the survey each covering 100 households. To ensure the quality of data, a four-level monitoring system was developed for each of the districts. The first level was team leaders who monitored the activities of two teams. Their work in turn was supervised by rotating monitors changing their place of supervision at intervals. The entire field activity was managed and monitored by a field supervisor (three monitors and one field supervisor). The researchers at BRAC RED head office monitored field activities through field visits at regular intervals.

Data analysis

Double entry of data was done using SPSS 14.0 and analysis was performed using STATA/SE 9.2 for Windows. The household was taken as the unit of analysis where expenditure on maternal health and neonatal health were the main focus. Uni-variate and bi-variate analyses were applied to assess the level and determinants of the household's costs associated with the utilization maternal healthcare. All cost amounts are presented in Taka².

² One US \$ is equivalent to BDT 68.89 Taka, (period average) in 2008, December. Bangladesh Bank.

FINDINGS

Socioeconomic characteristics

A household was defined as a person or a group of related and/or unrelated persons who usually live in the same dwelling unit(s), has common cooking or eating arrangements, and who acknowledged one adult member as head of the household (NIPORT, Mitra Associates and Macro International Inc. 2004). This may include a man, his wife, children and other relatives (father/mother, nephew, etc.) but we excluded those who are not dwelling together in recent six months leading to the interview. Table 2 summarizes statistics on respondents and household characteristics where households were mostly male-headed. Respondents were mostly in the 20 to 34 years age group; the mean age was 22.5 in Nilphamari and 24 for the baseline intervention and comparison areas. Most of the respondents were found to be currently married. The households had on average 5 members, with little variation between intervention and control districts. Households were mostly Muslim except Nilphamari having a greater proportion of Hindus. More than one-third of the households were found to have an extended family. Tubewells were found to be main source of drinking water in all areas. Sanitary latrine were used proportionately more by households in the control districts. The land-ownership pattern suggests that intervention districts had more landless households. About one-third of the mothers were found to be BRAC eligible³ and higher portion was under Targeting Ultra Poor (TUP)⁴ in Nilphamari. More than 50% of the mothers were found to be literate.

³ The criteria for the BRAC eligibility is that the household owns no more than half acres of land including homestead land, and at least one member of the household sells minimum 100 days of manual labour in a year to earn a livelihood.

⁴ TUP, one sub-group of CFPR, one of the safety net programme of BRAC.

Table 2. Respondents', and households' characteristics (%)

	Nilphamari	Baseline		p-value 2 vs 3	p-value 1 vs 2	p-value 1 vs 3
	Pilot	Proposed	Comparison			
	-1- (N = 200)	-2- (N=600)	-3- (N=400)			
Respondents' profile						
Respondents' age						
- <19 years	34.0	21.83	24.50	.488	.002	.017
- 20 – 34 years	62.0	72.50	69.67			
- ≥35 years	4.0	5.67	5.83			
Mean age	22.56(±4.88)	24.04(±5.55)	24.09(±5.88)	.879	.001	.002
Marital status						
- Married	98.5	99.7	99.5	.682	.070	0.204
- Others	1.5	0.3(2)	0.5			
Literacy of respondents						
- Can read and write	54.0	56.8	55.0	.732	.567	.484
Mean number of children ever conceived	2.4(±1.56)	2.5(±1.64)	2.6(±1.86)	.452	.178	.087
Mean number of children ever born	2.28(±1.50)	2.39(±1.53)	2.45(±1.70)	.535	.363	.212
Households' characteristics						
Sex of household head						
- Male	99.50	97.67	97.50	.866	.098	.085
Mean household size	5.45 (±2.08)	5.18 (±2.05)	5.15 (±2.21)	0.016	0.118	0.729
Religion						
- Muslim	75.0	95.5	90	.001	.000	.000
- Others	25.0	4.5	10.0			
Type of family						
- Nuclear	59.0	64.0	56.0	0.014	.205	.521
- Extended	41.0	36.0	43.0			
Sell labour						
- Yes	10.9	16.5	11.5	.000	.000	.616
- No	89.1	83.1	88.5			
Principal source of drinking water						
- Tubewell	98.50	99.00	97.25	0.036	.561	.339
- Others	1.50	1.00	2.8			
Sanitation facility						
- Sanitary (Water seal and septic tank)	13.0	16.8	22.5	.117	.012	.002
- Broken water seal	31.0	22.7	20.0			
- Open/pit/hanging	33.0	42.5	38.5			
- No latrine	23.0	18.0	19.0			
Amount of Land						
- None	.5	8.3	2.3	.000	.000	.008
- < 50 decimal	69.5	59.7	57.3			
- ≥50 decimal	30.0	32.0	40.5			
BRAC membership	14.0	13.2	9.3	.058	0.764	.078
Type of member						
- TUP	7.1	2.5	5.4	.595	.889	.223
- Dabi	82.14	69.6	67.5			
- Unnoti	10.71	25.3	24.3			
- Dk	-	2.5	2.7			
NGO involvement	40.5	42.83	34.25	.007	.536	.133
BRAC eligible						
- Yes	33.0	29	29.8	.799	.285	.416

Information on household expenditure (as a proxy for income) was used to describe the socioeconomic status of the households, and quintiles of socioeconomic status was constructed by ranking households by their average monthly expenditure, where Q1 is the lowest quintile and Q5 is the highest quintile representing the poorest and the richest households respectively. Table 3 shows the per capita household expenditure which has been derived from the reported households' expenditure and adjusting it for adult equivalent member (Appendix note 1) and household size. Monthly income (median) for the poorest group was Tk. 3,785 Tk. and 9,950 Tk. for the richest group of households.

Table 3. Pattern of household expenditure by socioeconomic status

Quintile	Mean household income (Tk)	Median household income (Tk)	Mean number of household members
Q1- Poorest n=240	4215.28	3785.0	5.8
Q2 n=240	5093.25	4602.0	5.1
Q3 n=240	6177.10	5736.5	5.2
Q4 n=240	7453.76	6997.5	5.3
Q5 - Richest n=240	11445.50	9950.0	5.3
N=1200	6876.98	5736.5	5.3

Besides, applying principal component analysis to the information obtained on assets/wealth of households in the main survey, wealth quintiles (Appendix note 2) were also constructed following the method developed by Rutstein and Johnson (Rutstein and Johnson 2004) to show the socioeconomic status of the households in our sample. The assets included for constructing wealth index, based on a set of variables used in the main survey questionnaire, were household assets, floor material, main roof material, main wall material, type of drinking water used by the household, and type of sanitation facility. We found a similar trend of higher wealth quintile household having higher level of mean household expenditure, and the mean number of household member was found to be higher in the lowest quintile pushing the per capita income down. Monthly expenditure (median) of the lowest wealth quintile was Tk. 4,728 and the highest quintile had the median expenditure of Tk. 8,540 (Appendix Table 2).

It is well established that consumption or expenditure are much more reliable and easier to collect than income especially in rural setting (Filmer and Pritchett 2001). The correlation between income quintile and wealth quintile was low (0.33). So we used adult equivalence adjusted per capita income, which most likely to suggest that assets used for

constructing wealth index may not truly reflect the socioeconomic status and can be due to poor selection of assets variable as suggested by O'Donnell (O'Donnell *et al.* 2008). However, further analysis is needed to explain this difference. Nevertheless, for the type of analysis this study is interested, quintile based in income (using household expenditure) is more appropriate.

In Gaibandha, a fewer numbers of households were found in the top most income quintile. In Nilphamari, less number of households were found to be in the lowest income quintile, and in Naogaon there were more households in the lowest quintile suggesting a higher number of poorer households (Table 4).

Table 4. District-wise distribution of households by income quintiles

Quintile	Nilphamari	Rangpur	Gaibandha	Mymensingh	Naogaon	Netrakona	Total
Q1	7.5%	23.5%	25.5%	15.5%	29.5%	18.5%	240
Q2	17.0%	15.0%	33.0%	17.5%	22.5%	15.0%	240
Q3	19.5%	14.0%	23.0%	18.5%	24.5%	20.5%	240
Q4	25.5%	20.0%	13.5%	26.5%	12.5%	22.0%	240
Q5	30.5%	27.5%	5.0%	22.0%	11.0%	24.0%	240
N	200	200	200	200	200	200	1,200

Utilization and cost of obstetric care

Utilization and cost of ANC

Utilization of ANC services can help identification of complications of delivery and promote use of skilled providers for delivery care. Of the 1,200 mothers in all the areas, 984 received ANC. Mothers in Nilphamari district had higher utilization of ANC services (95%) where BRAC's pilot MNCH intervention programme has been placed and can be said to have an impact on the level of utilization of the services (Appendix Table 3). There was a significant difference in the proportion of mothers seeking routine ANC care across the regions. Higher proportion of mothers in Nilphamari sought ANC and *Shasthay Karmi* (about 61%) plays a significant role as provider of the services in these districts and in proposed intervention districts (Appendix Table 3). In proposed intervention and comparison districts, the private doctors were found to be major provider (about 42% and 39% respectively).

Mothers who had their ANC at their home or their relative's home did not have to travel to obtain the services. A higher proportion (51%) of mothers in Nilphamari district received ANC services at home (Appendix Table 3). More mothers (about one-third) in intervention districts received

ANC services at home than the mothers in comparison districts (Appendix Table 5). Total costs of ANC in this report refer to the most recent visit (the last visit before the delivery care), and included the amount the household had to spend on providers' fee, medicine, and tests. The median costs to households who obtained ANC were higher in the comparison areas (Tk. 300) and the proposed intervention areas (Tk. 200), and the median costs of ANC services in Nilphamari was found to be zero as most of the mothers enjoy free ANC services from BRAC SKs (Table 5 and Appendix Table 3).

Table 5. Cost of antenatal care to the households

	Nilphamari		Baseline				P value 2 vs 3	P value 1 vs 2	P value 1 vs 3
	Pilot intervention		Proposed intervention		Comparison				
	-1- Mean (SE of Mean)	Median (25th & 75th quintiles)	-2- Mean (SE of Mean)	Median (25th & 75th quintiles)	-3- Mean (SE of Mean)	Median (25th & 75th quintiles)			
Cost of ANC care	110.5	0.0	398.3	200.0	457.2	300.0	0.042	0.000	.000
	19.9	0-70	31.7	0-500	44.2	70-525			
N	190		468		327.0				

Of 924 mothers who had ANC, about 61% (562) mothers used transport to obtain the service. Median transport cost was lower in the pilot intervention area and more households in comparison area had to pay for transport cost than in other areas (Appendix Table 5).

Utilization and cost of delivery care

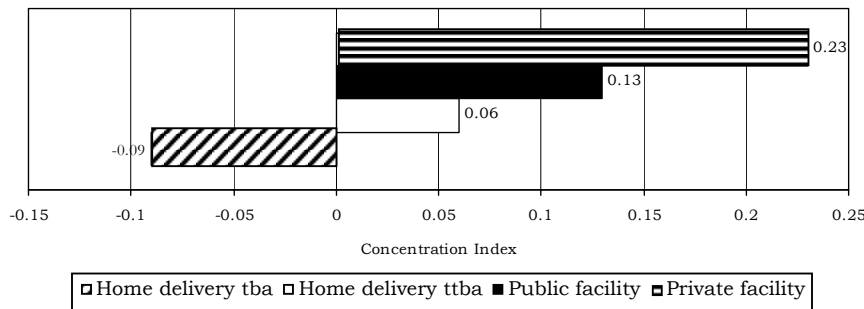
Home delivery dominates in all areas (83% in comparison, 80% in intervention and 78% in pilot intervention areas), slightly lower than the national level. The remainder took place in public sector facility (district hospitals, *upazila* health complexes, maternal and child welfare centre, and family welfare centre) and private hospital or clinic or NGO clinic. Unskilled providers (traditional birth attendants or TBAs, relatives and neighbours) were the major providers in all the three regions (Appendix Fig. 2).

As a measure of inequality in utilization of facility-based care or skilled care among different income quintiles, we estimated the concentration index⁵ (CI) for utilization of major types of facility/place of delivery and types of attendants. For our total sample, the CI measure suggests that

⁵ The concentration index (Kakwani 1977, 1980), does quantify the degree of socioeconomic- related inequality in a health variable.

there is a disproportionate concentration of mothers obtaining delivery care at home or using unskilled providers (CI=-0.09) suggesting utilization of home delivery services and unskilled providers at home are pro-poor. Utilization of public facility are pro-rich (CI=0.13) and are more pro-rich than the use of trained TBA at home (CI=0.06). Utilization of private facilities are pro-rich (CI=.23) (Fig. 1). At the district level, measure of inequality suggests home delivery is pro-poor in all districts favouring the women in poor income quintile, and the public facility in Naogaon is playing an important role in serving the poor, but in all other five districts the utilization of public facilities is pro-rich, and most pro-rich in Netrakona (CI=.72). Utilization of private facilities are pro-rich in all the six districts (CI = 0.06 in Nilphamari, 0.19 in Rangpur, 0.20 in Gaibandha, 0.36 in Netrakona and Naogaon, and 0.47 in Mymensingh). Utilization of TBAs at home are pro-poor in Gaibandha, Mymensingh and Niphamari. (Appendix Fig. 3).

Figure 1. Inequality in use of place of delivery



Total costs for delivery care included fees paid to doctor or providers by mothers, expenditure on medicine, tests and laboratory examination, other charges made to the facilities, cost of travel to the providers, and other travel-related expenses where applicable. In a poor rural setting, where TBAs are sometimes paid in kind, (food and other goods)⁶, the price of such items were used to impute a value to such items. The median costs of delivery care varied considerably by type of treatment and place of delivery (Table 6). As expected, mother who had their delivery care at home had lower levels of expenditure than those who used facilities. In Nilphamari, the median costs of normal delivery at home were found to be Tk. 100 when unskilled birth attendants were used, while it was Tk. 200 when skilled attendants⁷ were used. The median cost of delivery at a public or private hospital is considerably higher, Tk. 1,141 and Tk. 2,205 respectively. The median costs of normal

⁶ Mostly found to be case where birth attendants provided delivery care services at home.

⁷ Skilled attendant include family welfare assistant, trained traditional birth attendant, CSBA, nurse, doctors.

delivery are significantly different in Nilphamari and proposed comparison area, as free delivery care in the pilot intervention area likely to have greater influence on it.

Table 6. Cost of delivery care to the households

	Nilphamari		Baseline				p value 2 vs 3	p value 1 vs 2	p value 1 vs 3
	Pilot intervention		Proposed intervention		Comparison				
	-1-		-2-		-3-				
	Mean (SE of Mean)	Median (25 th & 75 th quintiles)	Mean (SE of Mean)	Median (25 th & 75 th quintiles)	Mean (SE of Mean)	Median (25 th & 75 th quintiles)			
Normal delivery									
Home delivery by skilled attendant	222.9	200.0	525.1	300.0	491.5	300.0	.411	.000	.000
	32.2	30-320	65.8	200-500	62.9	250-500			
N	59		121		108				
Home delivery by untrained attendant	202.7	100.0	394.9	250.0	412.6	300.0	.001	.000	.000
	51.6	0-225	40.8	100-414	32.0	250-500			
	91		365		224				
Public hospital	1158.8	1141.0	1757.9	1100.0	2445.8	1590.0	.097	.438	.022
	223.6	320-1370	309.6	350-2135	600.9	865-3080			
N	26		40		24				
Private hospital	3602.0	2205.0	4463.3	2924.0	3443.1	1590.00	.766	.501	.804
	1195.2	250-6060	929.9	800-5000	705.0	865-3080			
N	10		34		13				
On the way to facility	300.00	300.00	323.33	305	225	225	.499	1.00	1.00
	-	-	122.71	30-600	225	225			
N	1		6		2				
Caesarean section									
Public hospital	15125.0	15125.0	11991.8	10847.5	11962.0	10350.0	1.00	.505	.328
	3125.0	12000-18250	3215.2	8016-17000	4071.8	10160-18250			
N	2		6		5				
Private hospital	15023.18	12100	12039.36	10375	12677.71	10200	.992	.077	.117
	1464.011	11200-20000	1044.33	8300-13000	1290.261	7430-15250			
N	11		28		24				

Costs to the household were higher for Caesarean Sections (CS), as expected, and it was higher for mothers who gave birth of their babies at public facilities (median Tk. 15,125, 10,847.5, 10,350 for public facilities and 12,100, 10,375, 10,200 for private facilities for Nilphamari,

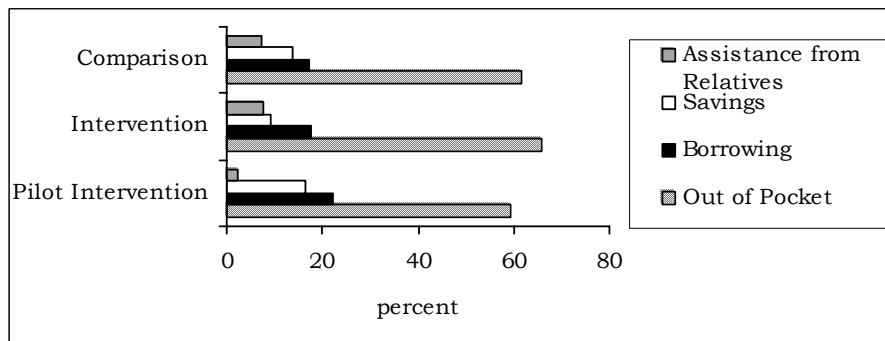
intervention and comparison areas respectively), however, no significant difference was observed between areas. The total costs of Caesarean Section delivery care were found to be higher at the public facilities than the CS delivery care in private facilities. This is mainly because mothers attending public facilities for CS had more complications and had to spend more on travel costs. Public facilities were found to be treating more of life threatening delivery care and complicated cases were also referred there from the private facilities. Mothers belonging to higher income quintile households had higher median costs for delivery care both in the intervention and comparison areas except Nilphamari. This is because they tend to use more expensive facility-based, often private services (Appendix Fig. 2)

Appendix Table 8 shows the distribution of household by areas who received free ANC and delivery care. More household in Nilphamari and Gaibanda received free ANC and delivery care (Appendix Table 9).

Source of financing for delivery care

Examining the source of financing for paying for maternal and neonatal care would enable us to assess the financial burden a household faced while obtaining such care. Out-of-pocket spending was found to be major source for paying (more than 65%) for delivery care for most of the households (Fig. 2) in the three regions.

Figure 2. Source of finance for delivery care



Borrowing, using household savings, and financial assistance from relatives were also found to be important in paying for delivery care. Savings include the money household saved for contingencies, while financial assistances from relatives are purely a grant to the households that need not to be paid back by the households. Mothers in Nilphamari, who could obtain free care with financial assistance from BRAC MNCH programme, were less dependent on such assistance. Spending out of

savings was higher in Nilphamari where the pilot intervention programme to some extent may have been successful in motivating mothers and households to save for contingencies that often are associated in seeking maternal and neonatal health services.

The median amount of borrowing was higher for mothers using facility-based delivery care, specially those who had CS delivery. About 42% of those who had C-Section had to borrow to pay for the services, however only less than 50% of them could pay back the money before the interview was scheduled. The amount of money borrowed was higher for CS delivery. About 89% households (216 of who borrowed) had to borrow more than 50 % of their delivery care cost.

On an average at least 15 to 20% of households in every quintile had to borrow for payment of delivery care. Borrowing was found to be higher in the proposed intervention areas where nearly 50 % of households had to borrow for delivery care. On an average repayment took about 5-6 months for mothers who had facility-based delivery care (Appendix Table 10), and about 133 mothers who had delivery care with skilled attendants had to borrow. If faced with post-natal complication or if their newborn needs healthcare, these mothers will be constrained by funding availability. Encouraging mothers to save for delivery care can reduce the burden of borrowing. However, this can only be possible for a small group of mothers whose expenditure for care are at least lower than 40% of the non-food expenditure discussed later in section. Most of those who borrowed to pay for delivery care in Nilphamari paid the money back within a short time in about 5.5 months. Whatever the amount, a greater proportion of households in the programme area were found not paying back any amount of it.

Table 7. Median amount of borrowing during recent delivery*

Mode of delivery	Place of delivery	Pilot intervention	Proposed intervention	Comparison
Normal delivery				
	Home with unskilled	103 (8)	500 (45)	360 (27)
	Home	450 (8)	500 (17)	450 (14)
	On the way to facility	-	160 (1)	200 (1)
	Public facilities	900 (13)	1200 (14)	2500 (10)
	Private facilities	3000 (7)	2000 (11)	2000 (5)
	Total	800 (36)	500 (88)	600 (57)
Caesarean section delivery				
	Public facilities	12000 (1)	16008 (2)	10000 (1)
	Private facilities	11000 (5)	8250 (14)	10100 (1)
	Total	11500 (6)	8250 (16)	10000 (1)

* Parentheses denote frequency.

Reasons for not using skilled care

Mothers who did not have skilled care attendants or did not use health facilities (public or private) for delivery care were asked to give reasons for not doing so. Most commonly cited reason was that they thought they did not face any life-threatening conditions during delivery. The other most reported reason was the cost considerations, because they thought the cost for such care was high and unaffordable. Cost as barriers to seek skilled care was reported by more mothers in proposed comparison and intervention districts. From the mothers who did not have skilled delivery care, a greater proportion of mothers in Nilphamari thought that they did not face any life threatening condition during delivery and hence skilled care was not necessary. And cost consideration was not reported by as many as we found in other two regions (Fig. 3).

Figure 3. Reasons behind not using skilled birth attendant



We tried to determine whether costs consideration influenced the decision of not obtaining delivery care from facility or from skilled care providers. Respondents who did not obtain delivery care from skilled attendant or from health facilities were asked about their preferred place of delivery with their expected cost or the amount they think they would need to pay for their preferred place of delivery. The respondents preferred public hospital. The median anticipated cost of delivery in

public hospital was Tk. 4,000 and for private Tk. 8,000 in comparison area which is higher than the median costs to the households who has actually used these providers (Table 8).

Table 8. Preferred provider and place of delivery care with their anticipated costs

Preferred place	Pilot Intervention			Proposed Intervention			Comparison		
	Expected cost (mother's vote)	Median cost from our survey data		Expected cost (mother's vote)	Median cost from our survey data		Expected cost (mother's vote)	Median cost from our survey data	
		Normal Delivery	CS		Normal Delivery	CS		Normal Delivery	CS
Skilled birth attendant at home	375 (6)	200	-	650 (8)	300	-	4000 (3)	350	-
Public facilities	2750 (74)	1141	15125	4000 (290)	1100	10847	4000 (178)	1590	10350
Private clinic/ NGO		2205	12100	7000 (39)	2924	10375	8000 (17)	3120	10200
N	80			340			198		

Cost of newborn care and post-natal care

The other components of obstetric care costs to the households include cost of neonatal care and post-natal care. Utilization of facilities for newborn care was found to be higher than post natal care. The median costs for newborn care was found to be Tk. 50 in Nilphamari, and Tk. 60 in the proposed comparison area and Tk. 100 in proposed intervention area. The median cost of post natal cost was found to be higher among mothers who had complication. The median costs of post-natal care in all the regions are higher than neonatal care (Appendix Table 6 and Appendix Table 7). Poor households may be deprived of proper care due to insufficient amount of funding available after some of them has already incurred substantial amount of expenditure for delivery care.

Total costs of obstetric care for the households

We defined total costs of obstetric care by adding the total costs of ANC (last visits only), total costs of delivery care, total cost of post-natal and neonatal care to show how much financial burden a household has to face due to pregnancy and child birth. Since we did not include the cost of all ANC visits, the total costs of obstetric care can be said to be underestimated. However, the costs of recent ANC reported earlier can suggest how much needs to be added if we assume that a pregnant mother should have at least three to four visits during the pregnancy. Table 9 shows total costs of obstetric care associated with different types of delivery in different areas. The median costs of total obstetric care to

the households for facility-based delivery care is an important indication of the amount of income subsidy for the poor would needed if they are provided free care at the facility. Median of total obstetric care costs to the households in case of home delivery with skilled attendant was Tk. 360 in Nilphamari, Tk. 590 in intervention and Tk. 1000 in comparison area. Total costs of obstetric care to the mothers of intervention and comparison was found over Tk. 2,000. With the MNCH programme providing financial support to the mothers using public facilities median of total costs of obstetric care was Tk. 1,285.

Table 9. Total costs of obstetric care

	Nilphamari		Baseline				P value 2 vs 3	P value 1 vs 2	P value 1 vs 3
	Pilot intervention		Proposed intervention		Comparison				
	-1-	-2-	-2-	-2-	-3-	-3-			
	Mean (SE of mean)	Median (25th & 75th quintiles)	Mean (SE of mean)	Median (25th & 75th quintiles)	Mean (SE of mean)	Median (25th & 75th quintiles)			
Normal delivery									
Home with skilled attendant	415.4	360.0	1101.1	590.0	1238.8	1000.0	.005	.000	.000
	51.3	75-590	124.7	300-1300	108.0	505-1586			
N	59		121		108				
Home delivery with untrained	411.9	140.0	866.8	510.0	1168.4	780.0	.000	.000	.000
	75.8	60-500	63.8	200-1160	99.2	345-1352			
	91		365		224				
Public hospital	1550.7	1285.0	2662.6	2035.0	3067.9	2588.0	.261	.138	.005
	255.0	600-2050	409.5	695-3315	685.7	1353-3490			
N	26		40		24				
Private hospital	4835.5	3205.0	5358.9	3420.0	4244.0	3480.0	.924	.674	.852
	1531.5	550-3700	1009.6	1620-5700	885.1	2030-5880			
N	10		34		13				
On the way to facility	440	440	1000	685	1749	1749	.317	1.000	.222
	.	440	409.0395	250-1400	1249	500-2998			
N	1		6		2				
Caesarean section									
Public hospital	16345.0	16345.0	13403.2	12452.5	13150.8	12550.0	.855	.505	.698
	4155.0	12190-20500	2731.0	8732-17250	4212.8	10730-130150			
N	2		6		5				
Private hospital	15867.7	13090.0	13470.7	11440.0	14302.1	11720.0	.769	.086	.227
	1442.0	12450-21000	1251.7	9457.5-15160	1541.8	8440-16900			
	11		28		24				

There may be additional indirect costs of care-seeking, such as lost wages or earnings. Such costs are difficult to measure as they vary according to income and employment status, and may be subject to seasonal variation as well. However, some studies have suggested that indirect costs of care-seeking can exceed direct out-of-pocket costs (Ensor and Cooper 2004; McIntyre *et al.* 2006). Mothers, mostly housewife, had on average 35; 44; 57 days lost for the delivery care before she returned to her usual daily works for Nilphamari, proposed intervention and comparison area.

Poverty impact or catastrophic payments due to obstetric and neonatal care

Patient's out-of-pocket payment due to health expenditure might be often catastrophic. All the medical expenses due to the obstetric care they experienced constitute an extreme burden that may push a household into poverty or into deeper poverty (Xu *et al.* 2003; McIntyre *et al.* 2006; Garg CC and Karan AK 2008;). Studies suggest that household expenditure for obstetric care or for severe obstetric complications can be catastrophic for households, and many households can be fall below the poverty level income (Borghi *et al.* 2006, Asante *et al.* 2007, Quayyum *et al.* 2009).

Spending 10 % of total expenditure on healthcare might be considered catastrophic and World Health Organization suggests that if household spend 40 % of non-food expenditure then they are making catastrophic payments (O'Donnell 2007). We classified catastrophic payments households considering these two threshold values.

Distribution of households with catastrophic payment

The distribution of the number of households with catastrophic expenditure for obstetric care across the districts and quintiles are shown in (Table 10). The number of households falling in this group is higher when we consider the threshold level defined as the obstetric care expenditure 10% of income. However, the number is quite low and most of household using home delivery and unskilled care which need a low level of payment. We found that higher number of households from Naogaon making catastrophic payments.

Table 10. Households facing catastrophic effects of payments for delivery care

	10% of total income						40% of non-food expenditure					
	Income quintile					Total	Income quintile					Total
	Q1	Q2	Q3	Q4	Q5		Q1	Q2	Q3	Q4	Q5	
Nilphamari	1	2	3	1	5	12		2	2	1	2	7
Rangpur	5	4	4	2	2	17	1	2	2	1		6
Gaibandha	1	3	4	1	1	10	1	3	3	1		8
Mymensingh	2	1	1	5	6	15	2	1	1	2		6
Naogaon	6	6	12	6	4	34	4	2	8	3	1	18
Netrakona		2		2	2	6		3		1	1	5
Total	15	18	24	17	20	94	8	13	16	9	4	50

If we do a simulation and estimate total obstetric care in a scenario where all the mothers have at least three ANC visit, and obtain the delivery care from facility we can see that the overall number of households making catastrophic payments increases 364 in all the regions as against 50 in the actual situation. We used the median costs of ANC visits in that area and multiplied by three (assuming three visits), and took the weighted mean of median normal delivery care cost and CS delivery costs (the weight being .85 and .15). Then we added median cost of neonatal care, and post natal care. These estimates suggest all the districts, except Gaibandha, would have more household making catastrophic payments. Here, we assumed that the households who were provided free care faced the median costs. In this simulation, we found no households in Gaibandha would face catastrophic payments compared to the actual situation where few cases had very high costs for facility level care and faced catastrophic payments.. So, bringing all the mothers in facility-based delivery care would require substantial financial support to the households, which can either be introduced with voucher schemes, or other measures to provide free facility faced delivery care.

We also looked at another scenario assuming a package where all mothers use three ANC, trained TBA at home and face the median cost of using trained TBA in the district, and added the median cost of post natal and neonatal care to the package. In this case we found one household had to face catastrophic payment. This implies that if low cost skilled care taken to the home this can be a cheaper option for the household and has less poverty impact of payment for obstetric care.

Assessing progressively of out-of-pocket payment

Out-of-pocket (OOP) expenditure on healthcare has significant implications on poverty in many developing countries. If expenditure on healthcare is not proportionate to the household income then the healthcare financing can be either progressive or regressive. To remove the barrier we would require a progressive healthcare financing.

Progressivity in health expenditure was measured using the Kakwani index⁸. Progressivity measures departures from proportionality in the relationship between out-of-pocket payment and ability to pay. Household monthly average expenditure was used as a proxy of income and thus as a measure of ability to pay. Of the all districts households in Nilphamari had the lower proportion of household income spent for delivery care. Quintile three in our total population had higher proportion of their income for delivery payment (Appendix Fig. 4). Progressivity was lower among those who used home delivery care than the others. It was observed that were less progressive for Gaibandha (Intervention) public and private hospital payments but progressivity was lower among those who used home delivery care than the others. Kakwani index is informative of the overall progressivity of health payments that can be allocated to households. The Kakwani for total payments is only very slightly positive, indicating near proportionality (Table 11). The Kakwani value, considering any mode of delivery, Nilphamari and Mymensingh shows stronger progressivity than the rests.

Payments for home delivery are progressive as they are cheap and mostly are provided by unskilled providers. This is not what is desirable. Out-of-pocket payment for delivery care is slightly progressive but need to make more progressive in order to make a positive impact on maternal and neonatal health outcome.

Table 11. Kakwani index of out-of-pocket payment for delivery care

	Overall Kakwani coefficient	Home TBA/ Neighbour	Home Trained TBA	Public Facility	Private Facility
Nilphamari	0.38	0.17	-0.02	0.27	-0.10
Rangpur	0.17	0.10	0.42	0.15	0.02
Gaibandha	0.10	0.19	0.33	0.15	-0.06
Mymensingh	0.39	0.18	0.16	-0.01	0.05
Naogaon	0.22	0.19	0.05	0.02	-0.06
Netrakona	0.27	0.14	0.12	0.56	-0.10

⁸ Kakwani values ranges from -2 to +1: whereas -2 indicates severe regressivity and + 1 indicates strong progressivity

DISCUSSION

This study was done to have a baseline assessment of household costs of obtaining maternal and neonatal health services in the proposed intervention and comparison area of the MNCH Project. A large proportion of mothers utilized services and facilities for antenatal care both in the proposed intervention (78%) and comparison areas (82%) and Nilphamari district (95%). The median cost to the households was zero in Nilphamari (where services were mainly provided free and at home), Tk. 200 and Tk. 300 in intervention and comparison areas respectively. Home delivery was predominant in all areas. Measures of inequality in our total sample households suggest inequality in utilization of skilled attendant and public facility for delivery care exists with home delivery concentrated among poor income quintile households. Apart from private practice services which are generally pro-rich, use of public facilities were also found to be generally pro-rich except in Naogaon districts. Use of trained TBA at home was also pro-poor in Nilphamari, Gaibandha and Mymensingh, while pro-rich in Naogaon and Netrakona districts. The study examined the reasons for not using skilled care providers. Cost for care was considered by many mothers thought about facility-based or skilled attendant delivery care is expensive and hence they decided not to seek this skilled delivery care. Several studies in Bangladesh (Koenig 2007; Hossein and Huque 2005; Afsana 2004; Afsana and Rashid 2001) support this argument.

In our study, the median cost of home delivery ranges from Tk. 100 to Tk. 350, while for home delivery with skilled attendant the median cost ranges from Tk. 200 to Tk. 300. The Matlab study (Borghi J 2006) states that the mean cost of delivery at home with traditional birth attendant was Tk. 331 (median Tk. 184). While for normal delivery care at public facility in these areas would cost the mothers from Tk. 2,000 to Tk. 3,000. Findings from Bangladesh Maternal Health Services and Maternal Mortality Survey 2001 suggest that median expenditures for delivery care were substantial among the relatively small number of deliveries without complications that took place in either public or private facilities (Tk. 1,001 or Tk. 2,501, respectively). The findings of that study state that median expenditures for deliveries with complications are actually higher in public facilities than in private facilities (Tk. 1,001 and Tk. 800, respectively), despite government policy that public services are free of charge (NIPORT, ORC Macro, John Hopkins University, ICDDR,B 2003). This report also focused that 43 % of cases involved no treatment cost (NIPORT, ORC Macro, John Hopkins University, ICDDR,B 2003). Normal

childbirth cost about Tk. 800 at the *Upazila* health complex and Tk. 1,600 at the medical college hospital, and emergency caesarean section cost about Tk. 13,000. With other complications, the estimated costs were Tk. 20,000–25,000 (Afsana 2004). Mean cost for normal delivery was Tk. 1,275 (US \$ 31.9) and for caesarean section Tk. 4,703 (US \$ 117.5) in government hospitals (Nahar and Costello 1998) in Dhaka. Our study findings suggest that the median cost of normal delivery in public facilities and private facilities were Tk. 1,186; 3,048, respectively where as for CS delivery the cost in public facilities was slightly higher (Tk. 12,000; 11,000 respectively). Such level of spending is often quite beyond the reach of poor households whose yearly income is around poverty level income of Tk. 57,000.

One of the limitations of the study, like many other studies, is that the costs of obstetric care are based on the estimates reported by the households, and it was not possible to gather information unofficial payments that are often made. Studies to gather costs to households from hospital records (Quayyum *et al.* 2009, Borghi *et al.* 2003) are often found to be more accurate measure for the costs to the households). We have only included maternal and neonatal care to examine the catastrophic payment. There may be other healthcare expenses for the households and the costs estimates are not directly comparable, nevertheless the implications on financial burden are useful.

When we asked about their idea about such costs, we found that median level of such anticipated costs were higher than the median costs for the households who have actually used those skilled providers or facility. Efforts should be made to make the charges more transparent, publicity of charges can help mothers to have the right idea about the amount of money they have to spend. Special effort may be needed to implement this in the public sector facilities.

The major source of funding such expenses for delivery care is out-of-pocket. Using household savings and borrowing are other two main sources. Borrowing, financial assistance from relatives, savings and selling asset, were found to be common means to finance obstetric care, as has been found in countries like Ghana and Benin, Indonesia, Nepal (Borghi *et al.* 2006 and 2003, Quayyum *et al.* 2009, Asante *et al.* 2007). When looking at poverty impact of payment for total obstetric care (antenatal care, delivery care, post-natal care and neonatal), we found that not too many households are facing catastrophic payment⁹, only 50 out of 1,200 household are making such payment. Our simulation with the assumption of all mothers making at least 3 ANC visit and using facility-based suggest that about 288 households will make catastrophic payments and most of them are from lower quintiles. These household

⁹ Spending 40% or more of the household's non-food expenditure.

would need financial support or payment protection for availing services of comprehensive and appropriate obstetric care. The households which satisfy BRAC eligibility criteria may be considered as household needing financial support. The financial support either could be arranged within any potential pre-payment schemes by the households who can afford to do so and that can think of establishing in the long run. Or for immediate solution, there could be a financial support to the providers who would provide services to the user at the point of use through a voucher schemes or other demand side financing measures like special funds that are used providing free services in MNCH intervention district, Nilphamari. We need to consider carefully how such a package can be provided with guaranteed price and quality. Since the capacity of public service health system may not be sufficient, the MNCH programme may need to work in partnership with other NGOs, BRAC *Shushasthya*, private providers and the government to provide the desired level of care for maternal and neonatal health.

POLICY IMPLICATIONS

Reducing cost of obstetric care, particularly for the poor should be major attempt to increase the utilization of skilled care. Encouraging able household to save for obstetric care, as planned in the intervention would be useful for even near poor households. Extreme poor households will continue to need financial support. Total cost of package where a mother use the desired level of ANC and delivery care at facility-based centres, then on average it would costs Tk. 4,849. This level of cost can be an indication for planning any pre-payment mechanism. If mothers use home-based skilled delivery care instead of facility-based care, then this package would costs Tk. 1,303. Policy makers can consider this amount in planning for resources, introducing any voucher schemes or other financing mechanism keeping in mind the poorest and poor household will need financial assistance. Besides, it is also important to think of how to provide these packages of care in a facility where price and quality are guaranteed. One way is in BRAC *Shushasthaya* who provides these services. Alternatively negotiate packages with public or private facilities.

Mothers, who are not using skilled attendants or facility-based care, need to have a proper idea about the costs they would need to pay if they want to do so. That will help understand what proportion of mothers are really considering cost while deciding to chose skilled or facility-based care.

REFERENCES

- Afsana K and Rashid SF (2001). The challenges of meeting rural Bangladeshi women's needs in delivery care. *Reprod Health Matters* 9:79-89.
- Afsana K (2004). The tremendous cost of seeking hospital obstetric care in Bangladesh. *Reprod Health Matters* 12:171-80.
- Asante F, Chikwama C, Daniels A and Armar-Klemesu M (2007). Evaluating the economic outcomes of the policy of fee exemption for maternal delivery care in Ghana. *Ghana Med Journal* 41:110-17.
- Bangladesh Bank Statistics Department (2009). *Economic Trends*. Dhaka, Government of Bangladesh.
- Bangladesh Bureau of Statistics (BBS) (2006). Preliminary report on Household Income and Expenditure Survey (HIES) - 2005. Dhaka: BBS, Government of Bangladesh.
- Borghji J (2001). What is the cost of maternal healthcare and how can it be financed? *In: Safe motherhood strategies: a review of evidence. Studies in health services organization and policy* V. De Brouwere and W. Van Lerberghe (Editors); 17: 247-96. Antwerp: ITG Press.
- Borghji J *et al.* (2003) Cost of near-miss obstetric complications for women and their families in Benin and Ghana. *Health Policy and Plan* 18(4):383-90.
- Borghji J, Ensor T, Neupane BD, and Tiwari S (2006). Financial implications of skilled attendance at delivery in Nepal, *Trop Med and Int Health* 11(2):228-37.
- Borghji J, Sabina N, Blum LS, Hoque ME and Ronsmans C (2006). Household costs of healthcare during pregnancy, delivery, and the postpartum period: A case study from Matlab, Bangladesh. *J Health Popu Nutr* 24:446-55.
- Costello A, Osrin D, Manandhar D (2004). Reducing maternal and neonatal mortality in the poorest communities. *BMJ*. 004; 329:1166-68.
- Ensor T (2004). Financing the costs of maternal care: cross-read of recent studies. *Prepared for Nepal Safer Motherhood Project*, Nepal.
http://www.nsmmp.org/publications_reports/documents/FinancingcostofMCSummary.pdf
- Ensor T, Cooper S (2004). Overcoming barriers to health service access: influencing the demand side. *Health Policy Plann* 19:69-79.
- Ensor T and Ronoh J (2005). Effective financing of maternal health services: a review of the literature. *Health Policy* 75:49-58.

-
- Filmer D and Pritchett L (2001). Estimating wealth effects without expenditure data --or tears: An application to educational enrolments in States of India. *Demography* 38:115-32.
- Garg CC and Karan AK (2008). Reducing out-of-pocket expenditures to reduce poverty: a disaggregated analysis at rural-urban and state level in India. *Health Policy and Plann*, doi:10.1093/heapol/czn046.
- Gwatkin D, Rutstein S, Johnson K, Pande R, Wagstaff A (2000). Socioeconomic differences in health, nutrition, and population in Bangladesh. Washington: World Bank.
- Gertler P Locay, L Sanderson W, Dor A. Gaag J (1988). Healthcare financing and demand for medical care. *LSMS working paper no: 37*. World Bank, Washington.
- Goodburn EA, Gazi R, Chowdhury M (1995) Beliefs and practices regarding delivery and postpartum maternal morbidity in rural Bangladesh. *Studies in Family Planning* 26:22-32.
- Hossein I and Hoque MM (2005). Determinants of choice of delivery care in some urban slums of Dhaka city. *Pakistan Journal of Social Science* 3(3):469-75.
- Hjortsberg C (2003). Why do the sick not utilise health care --The case of Zambia. *Health Econ* 2003;12(9):755-70.
- Kakwani NC (1977). Measurement of tax progressivity: an international comparison. *Econ J* 87(345): 71-80.
- Kakwani NC (1980). Income inequality and poverty: methods of estimation and policy applications. New York: Oxford University Press.
- Koenig MA, Jamil K, Streatfield PK, Saha T, Al-Sabir A, Arifeen SE *et al.* (2007). Maternal health and care-seeking behavior in Bangladesh: findings from a national survey. *International Family Planning Perspectives* 33(2):75-82.
- McIntyre D, Thiede M, Dahlgren G, Whitehead M (2006). What are the consequences for households of illness and paying for health care in low- and middle-income country contexts? *Soc Sci Med* 62:858-65.
- Nahar S, Costello A (1998). The hidden cost of 'free' maternity care in Dhaka, Bangladesh. *Health Policy and Plan* 13:417-22. doi:10.1093/heapol/13.4.417.
- National Institute of Population Research and Training (NIPORT), ORC Macro, Johns Hopkins University, ICDDR,B (2003). Bangladesh maternal health services and maternal mortality survey 2001. Dhaka, Bangladesh and Calverton MD: NIPORT, ORC Macro, Johns Hopkins University, and ICDDR,B.
- NIPORT, Mitra and Associates, and Macro International (2009). Bangladesh demographic and health survey 2007. Dhaka and Claverton, Maryland, USA: National Institute of Population Research and Training, Mitra Associate and Macro International, 381p.

NIPORT, Mitra and Associates, and ORC Macro (2005). Bangladesh demographic and health survey 2004. Dhaka and Claverton: National Institute of Population Research and Training, Mitra Associate and ORS Macro, 338p.

O'Donnell, Doorslaer Ev, Wagstaff A and Lindelow M. (2007). Analyzing health equity using household survey data: A Guide to techniques and their implementation. World Bank, Washington, DC pp-234.

Perkins M, Brazier E, Themmen E, Bassane B, Diallo D, Mutunga A, Mwakajonga T, Ngobola O (2009). Out-of-pocket costs for facility-based maternity care in three African countries. *Health policy and plan* 24(4):289-300; doi:10.1093/heapol/czp013.

Quayyum Z, Nadjib M, Ensor T, and Cahya PK (2009). Expenditure for obstetric care and effects of insurance on protecting poor *mothers*. Lessons from two districts in Indonesia. *Health policy and plan*: 1-11.

Rahman KMM, and Sarkar P (2009). Level of differentials of maternal healthcare utilisation in Bangladesh. *Research J of Med Sci* 3(4), 163-9.

Richard F, Witter S, De Brouwere V (2009). Reducing financial barriers to obstetric care in low-income countries. *Presented at XXVI IUSSP International Population Conference, 27 September-2 October 2009.* <http://iussp2009.princeton.edu/download.aspx?submissionId=92836> (accessed on 15/11/2009).

Rustein SO, Johnson K (2004). The DHS wealth index. Claverton: ORC Macro. 77p. (DHS comparative reports no. 6).

UNFPA (2007). Skilled attendance at birth: fact sheet, UNFPA, Geneva. http://www.unfpa.org/mothers/skilled_att.htm (accessed 12/08/2009).

Xu K, Klavus J, Kawabat K *et al.* (2003). Household health system contributions and capacity to pay: definitional, empirical and technical challenge. *In: Murray CJL, Evans DB (Editors). Health System Performance: Debate, New Methods and New Empiricism.* Geneva: World Health Organization.

APPENDIX

Appendix Table

Appendix Table 1. Sampling of MNCH baseline study

Study	Group	Pilot Intervention	Proposed Intervention	Comparison	Total	
MNCH baseline, 2008	Group 1	600	1800	1200	3600	
	1.1	Mother of under-1 live child	511	1484	984	2979
	1.2	Mother whose under-1 child died in the past year	28	69	42	139
	1.31	Mother who had abortion	36	151	120	307
	1.32	MR	16	57	30	103
	1.33	Still birth	5	18	14	37
	1.34	IUD	4	21	10	35
	Group 2	600	1800	1200	3600	
MNCH baseline, costing study 2009	1.1	Mother of under-1 live child	200	600	400	1200

Appendix Table 2. Pattern of households' expenditure by wealth quintile

Quintile	Median expenditure (Tk.)	Number of households	Mean number of household members
Q1	4728.5	244	4.9
Q2	5151.5	236	4.9
Q3	5300.0	237	5.1
Q4	6308.5	244	5.4
Q5	8540.0	239	6.3
Total	5736.5	1200	5.3

Appendix Table 3. Utilization of antenatal Care

Had ANC visit	Nilphamari		Baseline		P value	P value	P value
	Pilot intervention	intervention	Comparison	P			
				value			
	-1-	-2-	-3-	2 vs 3	1 vs 2	1 vs 3	
No	5.0	22.0	18.2	0.150	0.00	0.00	
Yes	95.0	78.0	81.8				
N	190	468	327				
Provider of last ANC							
Village doctor	5.3	12.0	16.0	.123	.034	.001	
<i>Shasthya Shebika</i>	1.1	1.5	2.4	.347	.807	.361	
<i>Shasthya Karmi</i>	60.9	20.8	8.4	.000	.000	.000	
Family welfare visit	4.2	5.2	11.2	.003	.875	.022	
Family welfare assistant	0.5	0.5	2.1	.050	.864	.214	
Traditional birth at	0.0	0.0	0.4	.231	-	.445	
Trained traditional	0.0	0.3	0.0	.402	.523	-	
Homeopath	2.7	4.9	6.3	.423	.318	.126	
Spiritual healer	0.5	0.3	0.7	.367	.509	.902	
Doctor	13.8	41.7	39.4	.608	.000	.000	
CNO/CNP	0.0	0.5	0.4	.783	.366	.445	
Pharmacist	0.0	0.5	2.4	.024	.366	.042	
Nurse/paramedic	2.1	10.3	9.8	.840	.002	.003	
Others	9.0	1.7	0.7	.552	.093	.248	

Appendix Table 4. Cost of delivery care to the households by income quintile

Income quintile	Nilphamari		Baseline				P value 2 vs 3	P value 1 vs 2	P value 1 vs 3
	Pilot intervention		Proposed intervention		Comparison				
	-1-		-2-		-3-				
	Mean (SE of Mean)	Median (25th & 75th quintiles)	Mean (SE of Mean)	Median (25th & 75th quintiles)	Mean (SE of Mean)	Median (25th & 75th quintiles)			
Normal delivery									
Q1	455.1 207.5	250.0 81-300	400.4 100.7	200.0 60-350	412.4 76.7	250.0 150-350	0.113	.659	.795
N	15		126		93				
Q2	121.7 30.0	48.5 0-200	599.3 199.4	250.0 85-400	622.8 97.7	300.0 250-600	.001	.000	.000
N	32		127		72				
Q3	575.4 242.3	275.0 87-400	632.2 106.2	300.0 150-500	872.4 218.6	360.0 250.0	.061	.277	.012
N	37		105		81				
Q4	519.5 162.3	100.0 0-450	678.6 81.1	400.0 250-700	798.5 158.8	400.0 300-600	.459	.000	.000
N	51		110		63				
Q5	760.3 232.2	280.0 70.5-505	1674.4 301.6	500.0 300-1500	729.7 115.3	500.0 350-600	0.264	.000	.000
N	52		98		62				
Caesarean section									
Q1			12466.67 2543.838	12200 8200-17000	12200 3627.327	10350 7050-19200	.827		
N			3		3				
Q2	16550.0 4450.0	16550.0 12100-21000	12103.0 1973.9	11750.0 9156-15050	8595.0 1510.3	10050.0 5575-10160	.157	.354	.083
N	2		4		3				
Q3	9880.0 1320.0	9880.0 8560-11200	9746.0 634.5	9725.0 8300-10560	10365.6 2257.5	7620.0 7000-10200	.288	.738	.479
N	2		6		9				
Q4			1944.6 10	8500-16500	3088.4 6	15150.0 15040-15400	.664		
N			10		6				
Q5	15849.4 1436.2	16800.0 12000-19645	11898.6 2423.6	10100.0 6150-13000	15257.5 2455.9	13575.0 9880-20400	.283	.119	.469
N	9		11		8				

Appendix Table 5. Travel and travel costs for obtaining antenatal care

	Nilphamari		Baseline				
	Pilot intervention		Intervention	Comparison	P value	P value	P value
	-1-		-2-	-3-	2 vs 3	1 vs 2	1 vs 3
Free as travel not needed	51.58(98)*		28.85 (135)	10.7(35)	.000	.000	.000
Had to incur travel cost	33.16(63)		57.26 (268)	70.64 (231)	.000	.000	.000
Median cost	40.00		50.00	50.00	.769	.045	.059
25th & 75th quintiles	20-100		30-100	30-100			
Walk	15.26 (29)		13.89 (65)	18.65 (61)	.070	.648	.326
N	190		468	327			
F,	40.46		1.41	36.12			
Prob > F	0.000		0.245	0.000			

*Parentheses represent frequency

Appendix Table 6. Cost during post-natal care

	Nilphamari		Baseline				P value	P value	P value
	Pilot intervention		Proposed intervention		Comparison				
	-1-		-2-		-3-		2 vs 3	1 vs 2	1 vs 3
	Mean	Median	Mean	Median	Mean	Median			
	(SE of mean)	(25th & 75th quintiles)	(SE of mean)	(25th & 75th quintiles)	(SE of mean)	(25th & 75th quintiles)			
Post-natal care	294.01	95.00	624.76	400.00	707.77	365.00	.433	.002	.001
	61.36	20-350	63.54	200-550	84.72	150.00			
N	126		231		211				

Appendix Table 7. Cost of neonatal care

	Nilphamari		Baseline				P value	P value	P value
	Pilot intervention		Proposed intervention		Comparison				
	-1-		-2-		-3-		2 vs 3	1 vs 2	1 vs 3
	Mean	Median	Mean	Median	Mean	Median			
	(SE of mean)	(25th & 75th quintiles)	(SE of mean)	(25th & 75th quintiles)	(SE of mean)	(25th & 75th quintiles)			
Neonatal care	266.82	50.00	209.79	60.00	459.91	100.00	.000	.578	.039
	74.02	20-162.5	24.17	0-200	67.37	0-300			
N	200		593		398				

Appendix Table 8. Last ANC sought and faced no cost

	Pilot intervention	Proposed intervention	Comparison	Total
Village doctor	7	6	4	17
<i>Shasthya Shebika</i>	1	0	2	3
<i>Shasthya Karmi</i>	69	23	2	94
Family welfare visitor	1	6	8	15
Family welfare assistant	0	0	3	3
Homeopath	4	2	2	8
Spiritual healer	1	0	0	1
MBBS doctor	6	19	9	34
CNO/CNP	0	2	0	2
Pharmacist	0	1	0	1
Nurse/paramedic	2	12	3	17
Don't know	8	12	2	22
Total	99	83	35	217

Appendix Table 9. Delivery care with free cost

	Pilot intervention	Proposed intervention	Comparison	Total
Home with TBA	25	56	26	107
On the way to facility	0	1	1	2
Home with TTBA	13	8	3	24
Total	38	65	30	133

Appendix Table 10. Borrowing amount and loan payment status in last delivery

Payback status	Pilot intervention		Proposed intervention		Comparison	
	loan Tk. (median)	Payback status (at month)	loan Tk. (median)	Payback status (at month)	loan Tk. (median)	Payback status (at month)
Normal delivery						
Yes, in full	830	5.5	600	6	300	6
Yes, half of it	3,000	6	500	5.5	1520	6
A quarter of it			2000	6	3900	7
No, nothing yet	400	6	350	5	450	5
Caesarean section						
Yes, in full	18,000	9	7500	4.5	10200	5
Yes, half of it	9,000	6	8300	6	10100	7.5
A quarter of it			8050	4.5	12575	4.5
No, nothing yet			10000	5	7500	7.5

Appendix Table 11. Free service during last antenatal care and delivery care (%)

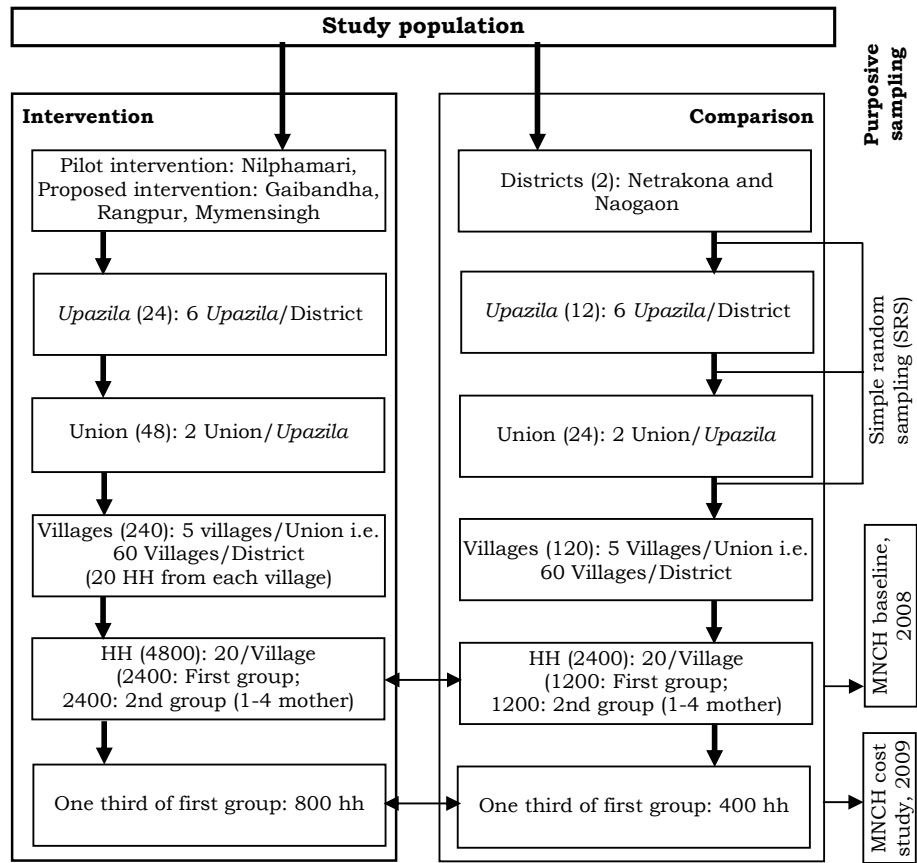
	Pilot intervention		Proposed intervention			Comparison		Total
	Nilphamari	Rangpur	Gaibandha	Mymensingh	Naogaon	Netrakona		
Free antenatal care	49.50	10.50	30.00	1.00	16.00	1.50	18.08	
n	(99)	(21)	(60)	(2)	(32)	(3)	(217)	
Free delivery care	19.00	5.50	21.00	6.00	10.00	5.00	11.08	
n	(38)	(11)	(42)	(12)	(20)	(10)	(133)	
N	200	200	200	200	200	200	1200	

Appendix Table 12. Households would face catastrophic effects of payments if everybody sought delivery care at facilities

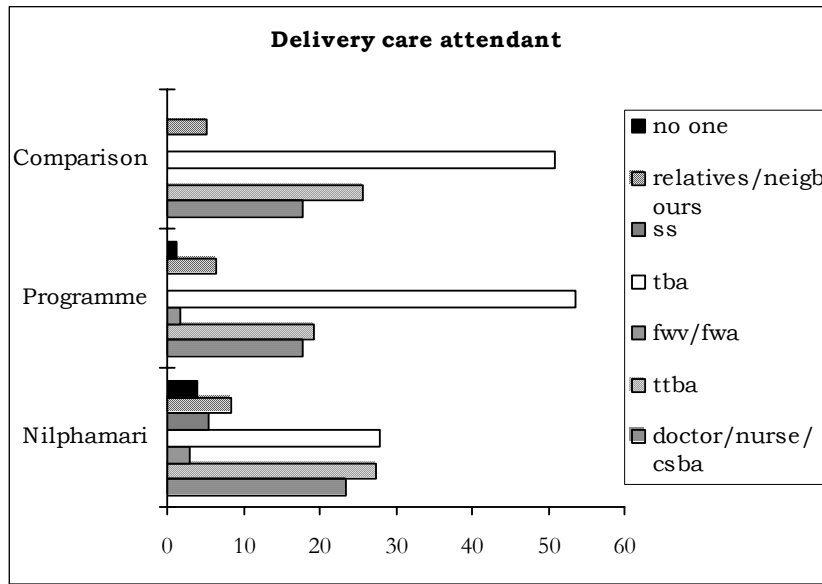
	10% of total income						40% of Non-food expenditure					
	Income quintile					Total	Income quintile					Total
	Q1	Q2	Q3	Q4	Q5		Q1	Q2	Q3	Q4	Q5	
Nilphamari	1					1	2					2
Rangpur	24	9				33	13	3				16
Gaibandha												62
Mymensingh	28	28	17	12	5	90	23	19	15	4	1	48
Naogaon	48	25	16	3		92	25	15	7	1		54
Netrakona	32	16	12	11	1	72	31	10	9	3	1	182
Total	133	78	45	26	6	288	94	47	31	8	2	364

Appendix Figure

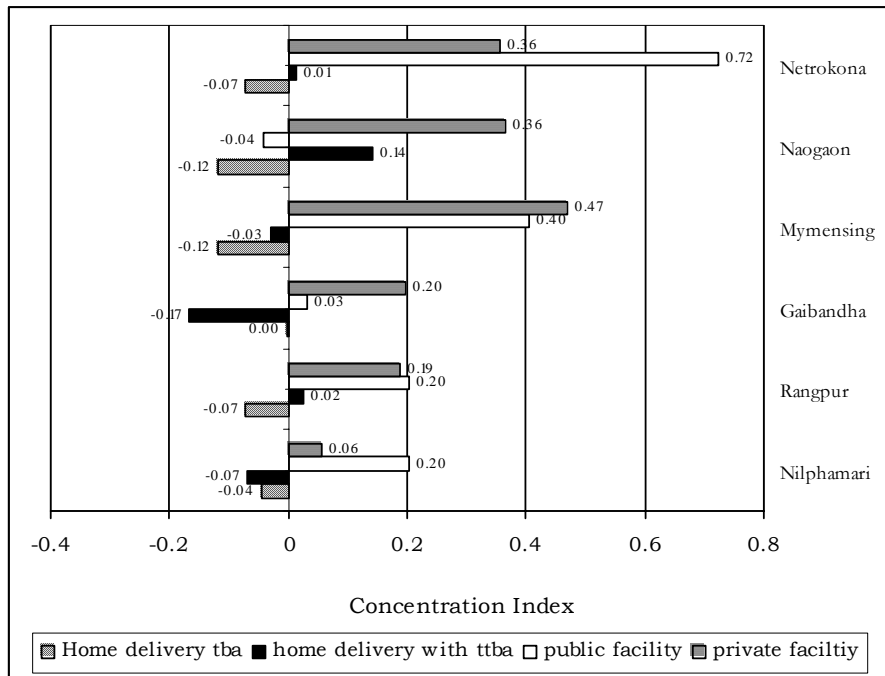
Appendix Figure 1. Sampling of MNCH baseline and cost study



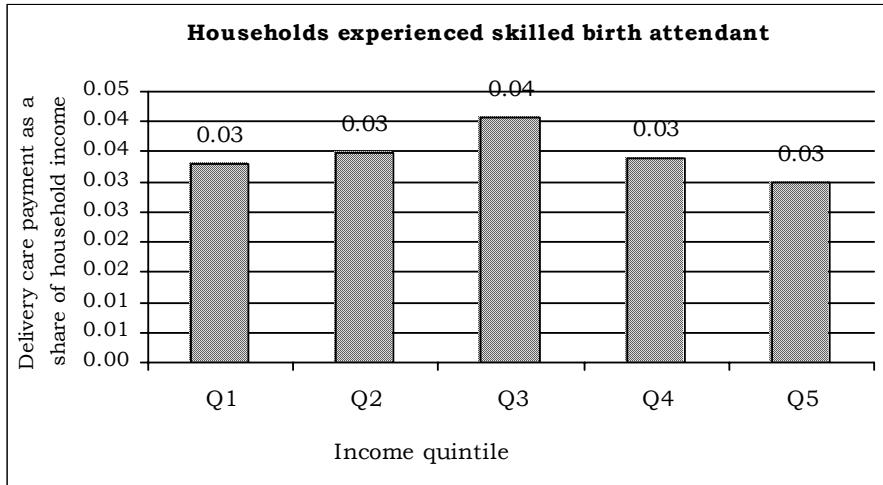
Appendix Figure 2. Attendants at delivery care



Appendix Figure 3. Inequality in use of place of delivery by district

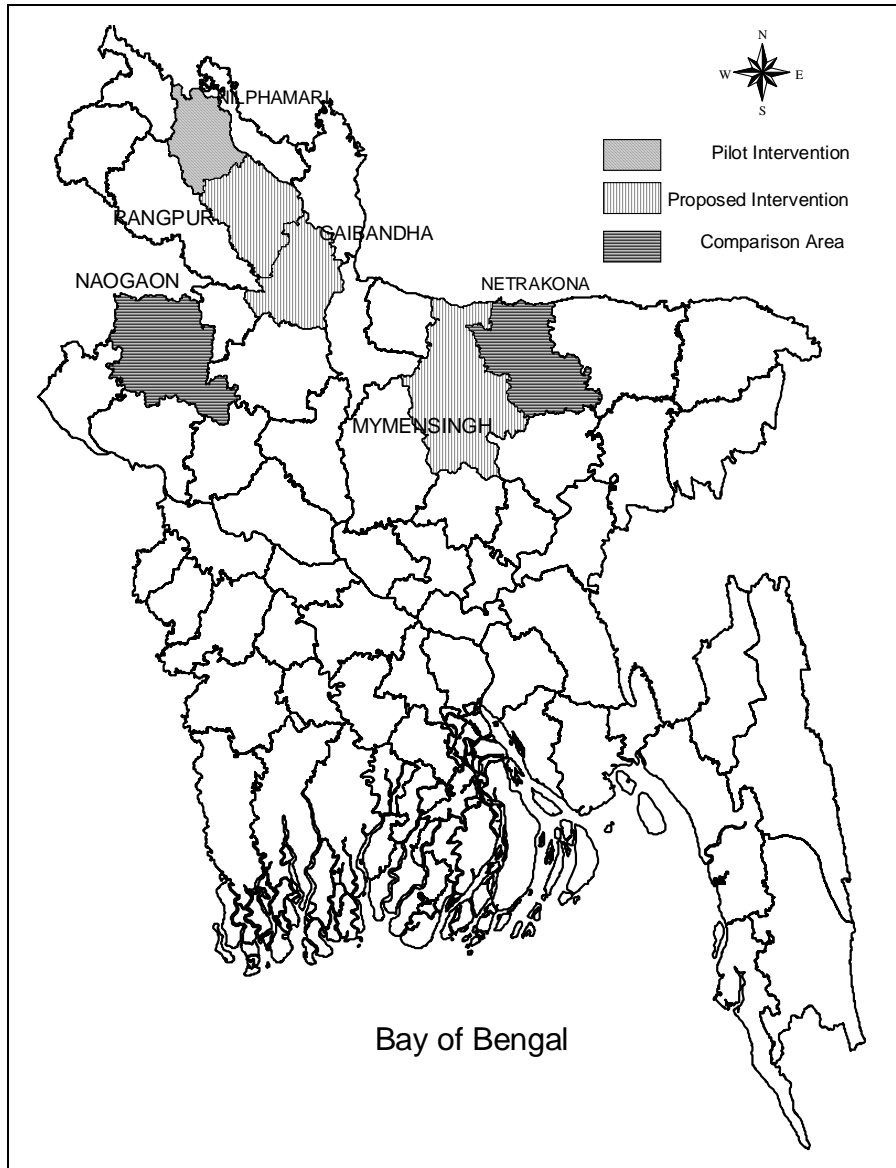


Appendix Figure 4. Out-of-Pocket payments as a percentage of total household expenditure



Appendix Map

Appendix Map 1. Study area



Appendix Note

Appendix note 1. Adult equivalent member

In the absence of detailed information on age of all household members it was not possible to develop an adult equivalence scale and adjust the per capita income accordingly. Age distribution of Bangladesh explains that population aged less than 15 years of age were 38% of total in rural area (HIES 2005). We attempted to develop an adult equivalence scale and to reflect a true per capita disposable income. $AE = (A + \alpha K)\Phi$, where A is total actual number of adults, K is the number of children, and Φ reflects household economic of scale. We used the value for $\alpha = 0.4$ and for $\Phi = 0.85$, and then used this number as adult equivalent members of the household.

Appendix note 2. Wealth Index

These are commonly used to draw attention to inequities in household income and the association with problems of access to health services and health-related outcomes (Gwatkin *et al.* 2000). The index we developed is similar to that used in the DHS survey. We used data on household assets and characteristics of the house (source of drinking water, sanitation facilities and type of material used for flooring, roof and walls). To form the index we recoded these variables into dichotomous form and used principal components analysis (PCA) (Rustein and Johnson 2004). Each variable was then assigned a weight based on its loading in the first general factor identified in PCA. The resulting score for each household was standardized with a mean of zero and standard deviation of one (Gwatkin *et al.* 2000). Households were then ranked and assigned a score in the range of one to five, those in the first quintile assigned a score of one, those in the second quintile assigned a score of two, etc. A one score identifies the poorest households and a five score identifies the richest households.