Improving Access to Delivery Care and Reducing Inequity through a Voucher Program: Lessons Learned from Bangladesh

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Abstract

For increasing access to safe delivery, the Government of Bangladesh introduced voucher program targeting poor expectant mothers. To examine whether facility-based delivery and delivery by medically trained provider increased and inequity decreased after program implementation, this study employed a quasi-experimental control group design with 3,300 mothers at baseline and 3,334 mothers at endline. Analysis showed that facility-based delivery increased by 13 percent, and delivery by medically trained provider became 34 percent from 21 percent in voucher areas with similar findings in non-voucher areas. Voucher increased public facility use and decreased private facility use significantly while in non-voucher areas, facility delivery mainly occurred in private facilities. Rich-to-poor ratio of facility delivery became 2.6 times from 4.5 times and delivery by trained provider became 2.5 times from 4 times in intervention areas with nearly similar change in control areas. Program needs better implementation, targeting to the poorest, with emphasis on staffing.

BACKGROUND

Underutilization of health facilities is common in developing countries and over the past few years policy makers have been revising existing policies to address this persistent challenge (Abodunrin et al. 2010). To improve facility based health service utilization, developing countries are adopting demand-side financing (DSF), such as vouchers and conditional cash transfers that encourages consumers more to seek care from designated service providers (Anwar *et al.* 2008; Behrman and James 1998; Bhatia and Gorter 2007; Bhatia *et al.* 2006). In the voucher-based system, service recipients, particularly of those living below the poverty line, are reimbursed for using designated and skilled healthcare providers to reduce the direct costs of healthcare and to increase demand for services (Borghi *et al.* 2006). Available evidence indicates that vouchers do improve service utilization among the target populations (Bellows *et al.* 2011; Bellows *et al.* 2013; Meuwissen *et al.* 2006; Obare *et al.* 2013; Rob *et al.* 2010). Although vouchers increase the use of health services, there is lack of information regarding impact of these programs (Gorter and Bellows 2008; Gupta *et al.*, 2010; United Nations Population Fund 2006; Ahmed and Khan 2011).

Primary maternal health services continue to favor wealthier households in lower and middle income countries (Houweling *et al.* 2007; Creanga *et al.* 2011). According to 2011 Bangladesh Demographic and Health Survey, 90 percent deliveries in lowest quintile and 40 percent deliveries in highest quintile occurs at home and only 29 percent of all deliveries are facility based (National Institute of Population Research and Training 2013). Home deliveries are assisted mainly by the traditional birth attendants. Deliveries conducted by untrained persons at home demonstrate the inequity in the access of women to health facilities (Falkingham 2003).

Bangladesh has a well-structured health service delivery system from central to the grass root level. Although government provides free ANC, delivery and postnatal care (PNC) services, the facilities are underutilized because of real out-of-pocket cost of medicines and surgical procedures and

transportation cost that negatively affect service utilization among the poor (Rob *et al.* 2006; Rahman *et al.* 2007) and ultimately consequence in 7,000 maternal deaths per year (National Institute of Population Research and Training 2012). In order to address these issues, the government of Bangladesh has introduced an innovative demand-side financing (DSF) scheme also known as Maternal Health Voucher Scheme in 2006(Directorate General of Health services 2007). The program covers the poorest for promoting institutionalized delivery and reducing maternal mortality in selected sub-districts (upazilas). There are some pre-set criteria through which government field workers identify poor pregnant mothers. The program distributes vouchers to poor pregnant women entitling them to: access three free antenatal care (ANC), delivery (normal and cesarean), complication management care, emergency referral, and postnatal care (PNC) services; free medicine for complications and delivery; and cash stipends for transportation. Besides, conditional transfer in the form of cash, and in-kind incentive is provided to the pregnant women for delivering with a designated qualified service provider. The incentives include Taka 2,000 (US$29) and a gift box for availing of safe delivery either in the facility or at home if assisted by skilled birth attendant (SBA) or medically trained provider (Rob *et al.* 2011; Directorate General of Health services 2007). Skilled birth attendant includes medical doctor, nurse, family welfare visitor (FWV), and community skilled birth attendant (CSBA).

The DSF scheme also allocates top-up funds to facilities, which are proportionately divided among designated staffs and a facility maintenance fund. Generally, 50 percent of the top-up funds are deposited in the "seed fund" from where associated expendable costs are incurred. Thus, the DSF for maternal health care in Bangladesh is a combination of supply-side incentives for providers and demand-side cash transfer for clients. The DSF program was expanded to 35 upazilas in two phases and in the third phase, another 11 upazilas were included. Population Council with fund from Bill and Melinda Gates Foundation undertakes a comprehensive evaluation of third phase DSF upazilas (11 Upazilas) with both baseline and endline surveys in 2010 and 2012-2013.

The aim of the study was to empirically examine the effect of DSF program in the use of facility based delivery services and delivery by medically trained provider. Specifically, when voucher is targeted only for the poor, does DSF increase delivery service use among the poorest women?

METHODOLOGY

Study design

Bangladesh's DSF program was initially launched in July 2004. The second phase has been expanded to another 12 upazilas in 2007 (Koehlmoos *et al.* 2008). Prior to 3rd phase scale up, Directorate General of Health Services (DGHS) identified 11 administrative upazilas which had comparatively lower health care service utilization accompanied by higher maternal mortality rate. Newly identified 11 upazilas were included in voucher program in 2010. This phased implementation has enabled to conduct a robust evaluation of the program where newly introduced 11 upazilas acted as intervention areas. Another 11 matched control non-DSF upazilas were selected from the same or nearby district based on several characteristics, e.g., availability of comprehensive or emergency basic obstetric care services, number of available service providers and support staff, number of beds,

presence of anesthesiologist and gynecologist pair, and literacy rate as a proxy to the socio-economic status (Rob *et al.* 2011).

To evaluate the impact of the demand-side financing scheme a quasi-experimental control group design utilizing baseline and end line surveys were employed with 6634 mothers. The national figure of 14.6 percent has been considered as baseline level of facility-based births in the voucher areas. To detect a 12 percent increase in the proportion of facility-based births, 1,650 experimental subjects and 1,650 control subjects were required to be able to reject the null hypothesis that the proportion of facility-based births for experimental and control subjects are equal with probability (power) 0.8. Eleven Upazila Health Complexes (UHCs) implementing the DSF program since 2010 (the 3rd phase) were the intervention facilities and 11 non-DSF UHCs were selected from the same or nearby districts as control facilities. Evaluation activities were limited to 22 UHCs and their catchment populations.

Data

From each of the 22 sites, 150 respondents were selected through multistage sampling. Three out of nine unions from each upazila were selected through probability proportional to size (PPS) to get required number of samples, i.e., 50 respondents per union. The next stage comprised the selection of three villages from each union through PPS. Finally, from each village, required numbers of respondents were selected at random from the list of pregnant mothers prepared by fieldworkers.

The key dependent variable for this study was delivery in health facility and delivery by Medically Trained Provider (MTP) while key independent variable was wealth index. Data were collected on age, education, voucher utilization, parity, and the use of maternal health services.

Equity in the access to maternal health services can be understood from an interaction between economic status and utilization of services. As a measure of economic status, a wealth index was calculated for all 6,634 households in the survey. Calculation of the wealth index allowed comparing socioeconomic status of every individual taking part in the evaluation study. The wealth index, which is used as a background characteristic in tables and figures, has been tested in a number of countries in relation to inequalities in household income, use of health services, and health outcomes (Ahmed and Khan 2011; Bollen *et al.* 2001; Filmer and Pritchett 2001, 1999; Wagstaff and Watanabe 2003, Rutstein and Johnson 2004; Rutstein *et al.* 2000). It is an indicator of the level of wealth that is consistent with expenditure and income measures (Rutstein 1999).

The key independent variable, the wealth index was constructed using household asset data and principal components analysis. Asset information was collected in the household questionnaire, which covers information on household ownership of a number of consumer items ranging from a mobile phone and radio to a bicycle or boat, as well as dwelling characteristics like building materials and land ownership. Each asset was assigned a weight (factor score) generated through principal component analysis, and the resulting asset scores were standardized in relation to a standard normal distribution with a mean of zero and standard deviation of one (Gwatkin *et al.* 2000). Each household was then assigned a score for each asset, and the scores were summed for each household. Individuals were ranked according to the total score of the household in which they resided. The sample was then divided into quintiles (5 groups) from one (lowest) to five (highest). To evaluate the effects of vouchers on socio-economic disparity in delivery care utilization, two different measures were examined:

1. Delivery in health facility
2. Delivery conducted or assisted by skilled or medically trained provider (MTP)

According to BDHS 2011, delivery conducted by medical Doctor, Nurse, Family Welfare Visitor (FWV), Midwife, Paramedic, Community Skilled Birth Attendant (CSBA) are MTP. This study also meant these service providers as MTPs.

Statistical analysis

The wealth quintile was cross tabulated with place of delivery, type of delivery, type of health facility and type of providers.

A difference-in-differences (DID) was estimated to evaluate the impact of the voucher program on the utilization of delivery care services. DID is calculated by subtracting changes in delivery services between 2012 and 2010 in voucher areas minus difference in changes in outcome in control areas.

$$\hat{d} = (\bar{Y}^{2012}{}_{\text{Voucher}} - \bar{Y}^{2010}{}_{\text{Voucher}}) - (\bar{Y}^{2012}{}_{\text{Control}} - \bar{Y}^{2010}{}_{\text{Control}})$$

For delivery service utilization, rich-to-poor ratios (ER) are calculated dividing the highest quintile (Q5) by lowest quintile (Q1). Equity ratio 1 means service utilization is same for poor and rich, ER more than 1 means service utilization is pro rich and ER less than 1 means poorest quintile is privileged.

Concentration curves plotting the cumulative outcome of delivery by the cumulative percentage of women ranked by wealth were created to graphically present inequality in delivery service use by wealth status (O'Donnel et al. 2008; Skiles et al. 2013).

RESULT

Information of delivery service presented in Table 1 indicates an increase in the proportion of the facility deliveries. Delivery conducted at health facility became 31 percent in 2012 compared to 19 percent in 2010 in the intervention areas with the control sites experiencing almost the same increase. The same improvement in control areas shows the null effect of voucher where the changeover changes is only 1.5 percentage points.

Table 1: Changes in the uptake of delivery services

Type of service	Intervention		Control		DID	P value
	2010	2012	2010	2012		
Place of delivery						
Home	81.5	68.9	79.3	68.2	-1.5	0.489
Facility	18.5	31.1	20.7	31.8	1.5	0.489
N	**1650**	**1662**	**1650**	**1672**		
Type of facility						
Public	41.2	50.9	37.7	33.5	13.9	0.004***
Private	57.2	43.3	60.8	64.8	-17.9	0.000***
NGO	1.6	5.8	1.5	1.7	3.9	0.018**
N	**306**	**517**	**342**	**532**		
Public facility type						
Tertiary hospital	26.2	14.1	25.6	19.7	-6.2	0.324
UHC	65.1	81.0	54.3	66.9	3.3	0.642
MCWC/ HFWC/CC	8.7	4.9	20.1	13.4	2.9	0.549
N	**126**	**263**	**129**	**178**		
Type of delivery						
Normal	89.3	80.0	85.3	77.7	-1.7	0.345
Cesarean	9.2	17.1	13.0	19.7	1.2	0.500
Assisted	1.5	2.9	1.7	2.6	0.5	0.439
N	**1650**	**1662**	**1650**	**1672**		
Type of provider						
Doctor	11.9	18.8	14.7	21.5	0.1	0.961
Nurse/FWV/midwife	8.1	12.9	8.9	12.5	1.2	0.417
CSBA	0.7	1.9	0.4	1.1	0.5	0.265
Unqualified provider	79.3	66.4	76.0	64.9	-1.8	0.397
N	**1650**	**1662**	**1650**	**1672**		
Delivery by MTP	**20.7**	**33.6**	**24.0**	**35.1**	**1.8**	**0.397**
N	**1650**	**1662**	**1650**	**1672**		

Inference: *** p<0.001; ** p<0.01; * p<0.05

Use of public-sector facilities for delivery services increased in intervention sites while control sites experienced a slight decrease meaning voucher worked in increasing pubic facility based delivery. The difference in differences (DID) of public facility delivery is 13.9 percentage points and the change is statistically significant. Analysis shows that in intervention areas, use of private facility decreased while control areas experienced a slight increase and the DID of private facility (17.9 percentage points) is found statistically significant. Voucher program is operated, distributed and implemented from Upazila Health Complex. Analysis shows that use of upazila hospital is more common (81 percent) in intervention areas compared to control areas (67 percent) which might be due to voucher services.

A consequence of the increased utilization of facilities for delivery services is reflected in the increased proportion of cesarean and assisted deliveries conducted. In contrast, number of normal deliveries decreased roughly 9 percent at intervention and 8 percent in control sites. Currently, one-

third of the births in voucher areas are attended by medically trained providers (MTP) e.g., doctors, nurses, FWVs, midwives and CSBAs in intervention sites. The DID of deliveries by MTP is 1.8 percentage points in voucher and much of this change comprised of an increase in proportion of deliveries by nurses, FWVs and midwives.

Table 2 reveals there was a gradual rise in the proportion of women using facility ranging from 9 percent to 40 percent in relation to wealth. With the increased utilization of facility, the variation continued ranging from 19 percent to 51 percent across the wealth groups in 2012 which means voucher program increased facility delivery among poor quintiles but could not remove persistent inequity.

Voucher recipients are entitled to have caesarean delivery if necessary. After introduction of voucher, caesarean delivery rate of the poorest and poorer section became eight percent and 11 percent respectively from four percent and two percent in baseline. Yet there is large variation in caesarean delivery among rich to poor quintiles. This clearly indicates the positive relation of wealth and caesarean delivery continued even after implementation of voucher.

Table 2: Changes in the uptake of delivery services across the wealth quintiles in intervention areas

Characteristics	2010					2012				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Deliveries at home	91.2	92.7	85.7	75.8	60.5	80.7	77.6	71.8	63.0	49.5
Deliveries at facility	8.8	7.3	14.3	24.2	39.5	19.3	22.4	28.2	37.0	50.5
N	**398**	**313**	**301**	**306**	**332**	**362**	**335**	**337**	**297**	**331**
Type of facility										
Public	54.3	65.2	55.8	50.0	23.7	65.7	69.3	61.0	51.8	29.9
Private	45.7	34.8	41.9	48.6	74.0	27.1	26.7	35.8	39.1	64.7
NGO	0.0	0.0	2.3	1.4	2.3	7.2	4.0	3.2	9.1	5.4
N	**35**	**23**	**43**	**74**	**131**	**70**	**75**	**95**	**110**	**167**
Type of delivery										
Normal	95.2	97.4	93.4	87.6	72.3	89.5	88.4	83.1	79.8	58.0
Cesarean	4.0	1.9	6.3	11.1	23.2	7.7	10.5	14.8	17.2	36.3
Assisted	0.8	0.6	0.3	1.3	4.5	2.8	1.2	2.1	3.0	5.7
N	**398**	**313**	**301**	**306**	**332**	**362**	**335**	**337**	**297**	**331**
Service providers										
Doctor	5.0	4.2	7.0	15.7	28.6	9.7	11.0	15.7	20.5	38.4
Nurse/FWV/midwife	5.0	3.8	8.3	10.1	13.6	10.8	11.9	12.5	17.5	12.7
CSBA	0.5	1.6	0.0	1.0	0.3	0.8	2.7	1.5	2.7	1.8
Unqualified provider	89.5	90.4	84.7	73.2	57.5	78.7	74.3	70.3	59.3	47.1
N	**398**	**313**	**301**	**306**	**332**	**362**	**335**	**337**	**297**	**331**
Delivery by MTP	10.6	9.6	15.3	26.8	42.5	21.3	25.7	29.7	40.7	52.9
N	**398**	**313**	**301**	**306**	**332**	**362**	**335**	**337**	**297**	**331**

Table 2 shows that there is an increase in seeking delivery care from qualified providers by the top wealth group. Comparison shows that half women in the richest wealth group received delivery care by MTP compared to one in five women in poorest wealth group which suggest receiving professional maternity care is much more dependent on the affordability of the households.

Table 3: Changes in the uptake of delivery services across the wealth quintiles in non-voucher areas

Characteristics	2010					2012				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Deliveries at home	91.7	88.7	84.9	70.1	62.3	82.6	76.8	71.6	62.0	50.5
Deliveries at facility	8.3	11.3	15.1	29.9	37.7	17.4	23.2	28.4	38.0	49.9
N	302	318	351	361	318	305	332	347	353	335
Type of facility										
Public	40	33.3	35.8	40.7	36.7	41.5	45.5	31.6	35.1	26.3
Private	56	63.9	60.4	58.3	63.3	56.6	53.2	68.4	64.9	73.1
NGO	4	2.8	3.8	0.9	0	1.9	1.3	0	0	0.6
N	25	36	53	108	120	53	77	95	134	167
Type of delivery										
Normal	94.0	92.1	89.7	80.6	70.4	89.5	86.7	81.0	72.5	60.0
Cesarean	5.6	7.5	8.8	17.5	24.8	8.9	10.8	16.7	24.4	36.4
Assisted	0.3	0.3	1.4	1.9	4.7	1.6	2.4	2.3	2.8	3.6
N	302	308	351	361	318	305	332	347	353	335
Service providers										
Doctor	6.3	7.9	10.0	20.2	28.6	9.8	12.3	19.3	26.1	38.8
Nurse/FWV/midwife	3.3	6.3	7.4	12.7	16.0	9.2	13.0	11.2	17.0	17.0
Unqualified provider	90.4	85.8	82.6	67.0	55.3	81.0	74.0	69.5	56.9	44.2
N	302	308	351	361	318	305	332	347	353	335
Delivery by MTP	9.6	14.2	17.4	33	44.7	19	25.3	30.5	43.1	55.8
N	302	308	351	361	318	305	332	347	353	335

Table 3 reveals there was a gradual rise in the proportion of women using facility ranging from 8 percent to 38 percent in relation to wealth. With the increased utilization of facility, the variation continued ranging from 17 percent to 5o percent across the wealth groups in 2012 which means even without voucher program facility delivery among poor quintiles increased.

Table 4: Rich-to-poor ratios in the uptake of delivery care services across sites over time

	Intervention		Control	
Characteristics	**2010**	**2012**	**2010**	**2012**
Deliveries at facility	4.49	2.62	4.54	2.91
N	**1650**	**1662**	**1650**	**1672**
Type of facility				
Public	0.44	0.46	0.90	0.62
Private	1.62	2.39	1.13	1.14
NGO	0	0.62	0.00	1.26
N	**307**	**507**	**342**	**526**
Delivery type				
Normal	0.76	0.65	0.75	0.67
Cesarean	5.80	4.71	2.32	15.66
Assisted	5.63	2.03	15.67	4.43
N	**1650**	**1662**	**1650**	**1672**
Service provider				
Doctor	5.72	3.96	4.54	3.96
Nurse/FWV/ Midwife	2.72	1.18	4.85	1.85
CSBA	0.60	2.25	0.65	2.15
Unqualified	0.60	0.60	0.61	0.54
N	**1650**	**1662**	**1650**	**1672**
Delivery by MTP	4.00	2.48	4.53	2.93
N	**1650**	**1662**	**1650**	**1672**

Rich-to-poor ratio for the delivery service utilization shows that in intervention sites richest quintile were 4.5 times more likely to deliver at health facility which decreased to 2.6 times after voucher implementation. Poor women mainly utilized the public facilities (ER 0.44) and the ratio did not change in endline (ER 0.46) indicating that the use of public facility is pro poor even after voucher program implementation. Again, rich-to poor ratio of normal delivery did not show any noticeable changes after introduction of voucher meaning that poor had no choice like rich to go for cesarean delivery. There has been lower likelihood among women in the poorest households in conducting deliveries through caesar although the cesarean delivery likelihood became 4.7 times in endline in intervention areas from 5.8 times in baseline. On the other hand in baseline, rich were four times more likely to receive delivery care from medically trained providers in intervention areas that changed to 2.5 times in endline and similar change is observed in control areas. According to Table 4, economic status is positively associated to the utilization of professional delivery care.

The concentration curves in Figure 1 and Figure 2 plot the cumulative share in facility delivery by wealth status before and after voucher program for intervention and control areas. Figure 3 and Figure 4 show the cumulative share in delivery by MTP according to wealth quintiles for both areas. The line of equity shows the equality of health outcome among poor and rich quintiles. In the *y*-axis, the cumulative outcome of facility delivery and delivery by MTP are shown. Women are plotted in the *x*-axis by the wealth quintile starting from poorest to richest. In delivery service utilization from facility and from MTP, both baseline and endline curves are below the equity line meaning that disparity or inequity exist among different wealth quintiles. The equity gap is evident in both delivery in health facility and delivery by MTP but the gap is reduced widely after the implementation of

voucher program (Figure 1 and Figure 3) while reduced less in control areas (Figure 2 and Figure 4). The wider reduction of equity gap might be attributable to voucher program.

Figure 1 and 2 Concentration curves for Facility delivery in voucher areas and non-voucher areas

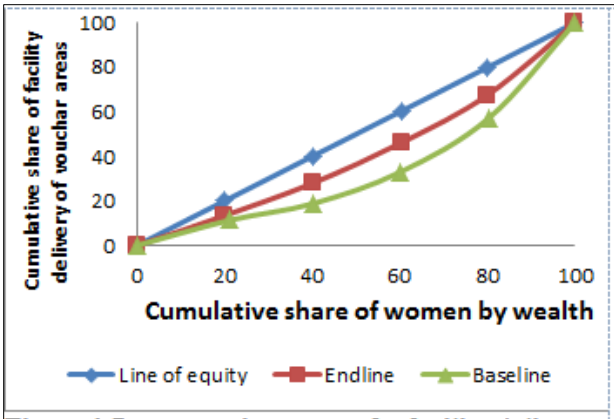

Figure 1 Concentration curves for facility delivery of voucher areas

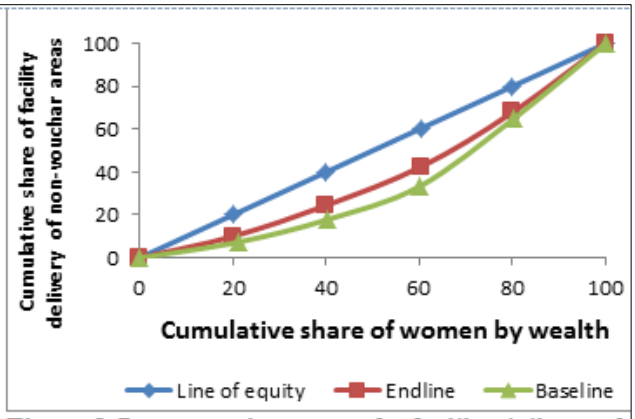

Figure 2 Concentration curves for facility delivery of non-voucher areas

Figure 3 and 4 Concentration curves for delivery by medically trained provider in voucher areas and non-voucher areas

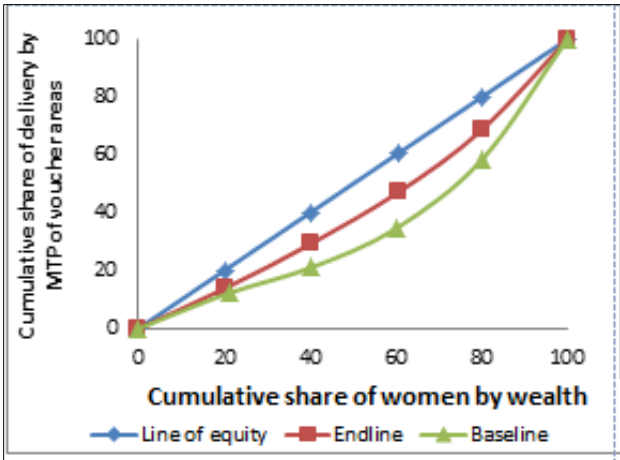

Figure 3 Concentration curves for delivery by medically trained providers of voucher areas

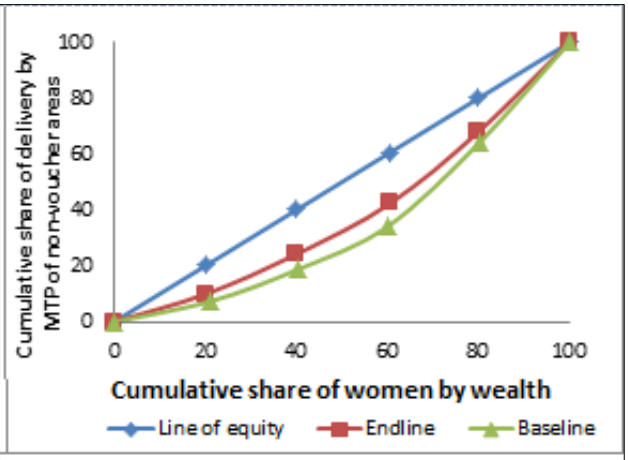

Figure 4 Concentration curves for delivery by medically trained providers of non-voucher areas

DISCUSSION AND CONCLUSION

To increase the facility based delivery and delivery by skilled provider of the rural population, government of Bangladesh introduced DSF program covering both demand side and supply side incentives. Increased health service utilization due to financial incentives is found in many countries (Rob *et al.* 2010, Skiles *et al.* 2013, Ahamd and Khan 2011). Our study found that delivery conducted at health facility became 31 percent in endline from baseline 19 percent in the intervention areas

with the control sites experiencing almost the same increase. The null effect of incentive is similar to *Chiranjeevi Yojana* program implemented in Gujarat (Mohanan et al. 2014). It is important to target the right person for increasing uptake of delivery service.

In Bangladesh, voucher program offers free delivery service mainly in designated public health facilities. Although the previous DSF phases included some private and NGO run hospitals, 3rd phase DSF program had no such designated private or NGO facilities. Therefore, delivery service increase in public facilities is attributable to voucher. Analysis shows that after implementation of voucher, use of public-sector facilities increased significantly ($p < 0.001$) in intervention sites while control sites experienced a slight decrease meaning voucher worked. On the other hand utilization of private health facilities decreased significantly ($p < 0.01$) in the program areas and increased in the control areas. DSF program is implemented and operated through Upazila Health Complex (voucher distribution, offering service, community involvement and reimbursement). Voucher improved the UHC use to 81 percent from baseline 67 percent in intervention areas.

A consequence of the increased utilization of facilities for delivery services is reflected in the increased proportion of cesarean and assisted deliveries conducted. Keeping in mind the tradition of home delivery in Bangladesh, DSF program provide incentives for home based delivery if assisted by a designated service provider. Our study found that delivery by MTP increased to 34 percent in 2012 from 21 percent in 2010 in intervention areas with the similar findings in non-voucher areas. The similar improvement in both sites indicates that voucher program is either not fully functional or may not attract the beneficiaries potentially to utilize delivery services. This evaluation study was conducted before the program completed two years of voucher implementation. Voucher scheme needs time to gain momentum (Ahmed and Khan 2011). It is evident that health facilities located in poorer communities are understaffed, equipment are not mostly functional or underutilized due to lack of technical person, resulting in health service less utilized for the clients (Castro-Leal et al. 2000, Victoria et al. 2003). The picture is quite similar in the underutilized public health facilities in Bangladesh. Rob et al. found that even a voucher recipient may not utilize health facilities reasoning that they did not percieve facility based delivery is necessary, facility is far, no one to accompany to health facility, labor started suddenly when nearby facility was closed, and lack of quality services (Rob et al. 2010). Quality is a serious issue to attract clients especially for delivery services. Skiles et al. found in Rwanda, performance based finance (PBF) was focused on service increase rather than quality which ultimately affect facility use for maternal health services. Similarly, DSF program was designed specially to increase health service output and quality was chronically understaffed. Inputs were limited to demand side and supply side incentives and issues such as training, motivation, monitoring, and available staff were not a serious concern. If voucher recipient experiences improved access and quality service, she would discuss the experience with the community people which would subsequently increase the service use.

Consistent with results reported by other researchers (Ahmed and Khan 2011, Skiles et al. 2013), our study found that voucher program increased facility delivery among poor quintiles and reduced inequity but could not remove persistent inequity completely. After introduction of voucher, caesarean delivery rate of poorest and poorer section became eight percent and 11 percent respectively from four percent and two percent in baseline. Yet there is large variation in caesarean delivery among rich to poor quintiles. This clearly indicates the positive relation of wealth and caesarean delivery continued even after implementation of voucher. In Bangladesh, underutilization of maternal health care services by poor people is a persistent challenge (Castro-Leal et al. 2000; Brazier et al., 2009, Ahmed and Khan 2011). This study also found that the low use of delivery

services either from facility or by skilled providers among the poorest and poorer section. Comparison shows that half women in the richest wealth group received delivery care by MTP compared to one in five women in poorest wealth group which suggest receiving professional maternity care is much more dependent on the affordability of the households. Rich-to-poor ratios for the delivery service utilization shows that in intervention areas, richest quintile women were 4.5 times more likely to deliver in health facility. After voucher implementation, the equity gap between richest tercile and poorest tercile decreased to 2.6 times, although voucher program is implemented targeting the poorest of the poor.

Bangladesh has gain remarkable success in improving maternal health service utilization over the past years including reducing the equity gap. This study suggests that facility based delivery service and delivery by skilled provider is alarmingly low and reducing the equity gap in service utilization is not satisfactory when voucher is targeted for the poorest of the poor. Again similar service uptake in intervention and control areas is a serious concern. Although the voucher expanded public facility utilization, still poorest and poorer tercile's service uptake is below the acceptable level. Our study found, weak implementation in some upazilas undermined program performance and likely resulted in study null effects. Program needs to improve targeting of the DSF subsidy to the poorest. Program also needs to ensure that incentives result in facility readiness, with a particular emphasis on staffing Anesthetists and Gynecologists

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