

EVALUATION OF THE DELIVERY FEE EXEMPTION POLICY IN GHANA: POPULATION ESTIMATES OF CHANGES IN DELIVERY SERVICE UTILIZATION IN TWO REGIONS

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SUMMARY

Objectives: To determine changes in the proportion of deliveries at health facilities and the proportion attended by health professionals after delivery fee exemption implementation.

Design: Pre and post intervention implementation cluster-sampled household survey.

Setting: Central and Volta regions of Ghana.

Participants: Women who had delivered in these regions during the fee exemption policy and an equivalent period of time prior to it.

Main outcome measures: Place of delivery and person attending.

Results: After fee exemption implementation the likelihood of delivering in a health facility increased significantly in Central (OR 1.83, $p < 0.001$) and Volta (OR 1.34, $p < 0.05$) regions when accounting for the mothers' education and poverty levels and the clustered data. Results from Central Region showed increases in facility deliveries mainly occurred in health centres (from 13.7% to 22.3% of deliveries), and were attended by midwives (from 49.0% to 59.7%). There was evidence that after implementation some inequalities in the uptake of facility deliveries decreased. The greatest increase in the proportion of deliveries taking place in facilities occurred among women with the lowest levels of education (Central Region) and wealth (Volta Region). These changes reduced the differentials observed.

Conclusions: After the implementation of fee exemption the proportion of deliveries in health facilities increased in both regions. Although changes cannot be directly attributed to delivery fee exemption, results demonstrating that the greatest increases in facility-based deliveries occurred among the poorest and least educated women are consistent with the expectation that the policy would particularly benefit women with the

greatest financial barrier to health care and at the greatest risk of maternal mortality.

Keywords: Women's health, delivery service utilization, fee exemption, programme evaluation.

INTRODUCTION

One of the Millennium Development Goals is to reduce maternal mortality by three-quarters by 2015 (<http://www.un.org/millenniumgoals>). So far, relatively little progress has been made globally, and donors and governments are looking for cost-effective and sustainable approaches that can reduce maternal mortality. An aspect felt to be of particular importance is to increase the proportion of women who deliver with a skilled health professional in attendance. This is a key component of the Safe Motherhood Initiative (<http://www.safemotherhood.org/>). Ghana has a persistently high maternal mortality ratio, estimates range from 214 to 800 per 100,000 live births (with considerable uncertainty around estimates)^{1,2}, and growing social inequalities, with rates of health professional attendance either stagnant or declining for poorer women³.

In September 2003 the Government of Ghana introduced the policy of exempting all users from delivery fees in health facilities. The policy of free delivery care had the purpose of reducing the financial barriers to using maternity services. It was expected that the policy would lead to an increase in the proportion of deliveries in health facilities and, hence, professionally attended deliveries, thereby leading to a reduction in maternal and perinatal mortality⁴. Finance has been identified as one of the major barriers to accessing health care facilities⁵ and user fee exemption has been shown to increase health service utilization in other areas of health^{6,7}.

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The government policy of providing universal free delivery care was evaluated by Impact (<http://www.impact-international.org/>). The overall aim of the evaluation was to assess how the free delivery policy affected utilization, quality of services and health and non-health outcomes for households in the Central and Volta regions of the country⁸.

Although health facility data already showed increased numbers of deliveries after the introduction of the fee exemption scheme,^{9,10} any change in proportion of deliveries in facilities could not be determined from these data. This paper describes a household survey of delivery service utilization, one component of the overall evaluation, which aimed to put these facility-based reports in context by giving population-based estimates of delivery service use and professional attendance at delivery before and after the introduction of the fee exemption policy.

The objectives of the study were, for each region:

- To measure any change in the proportion of deliveries at health facilities occurring at the time of the fee exemption policy;
- To measure any change in the proportion of deliveries attended by a health professional over the same time period; and
- To stratify any changes identified by education and poverty level.

MATERIALS AND METHODS

Study areas

The regions chosen for inclusion in the case study were Central, one of the first regions to join the delivery exemption scheme in September 2003, and Volta, one of the regions included from April 2005. Within each region, six focus districts were chosen purposively, matched across the two regions for poverty rates, presence of a hospital, size of population and urban-rural profile⁸. The chosen districts in Central Region were Cape Coast, Abura Asebu Kwamankese, Mfantseman, Gomoa, Awutu Effutu Senya and Agona; and in Volta Region were Ho, Kpando, North Tongu, Jasikan, Nkwanta and Keta⁸.

Study population

The study population was women who delivered a baby during the fee exemption phase, and those who had delivered during an equivalent duration of time prior to the fee exemption phase. The study population consisted of women who agreed to participate and who met the criteria.

Exact policy implementation dates in each region were verified from other work as part of the evaluation¹¹. Therefore, the before and after implementation dates used were 1/7/2002-31/12/2003 and 1/1/2004 - 30/6/2005 respectively in Central Region (18 months for each phase), and 1/10/2004 - 31/3/2005 and 1/4/2005 - 30/9/2005 respectively in Volta Region (six months for each phase)¹¹.

Study design and cluster sampling

A cluster survey design, similar to that used by the DHS¹², was used to allow a random and representative population sample to be practically surveyed to measure service utilization. The sampling frame was the Ghana 2000 census data¹³. The cluster-sampling units were census Enumeration Areas (EAs).

EA sizes in the districts selected ranged from 1-1144 women of reproductive age (WRA, aged 15-49 years) in Central Region and from 1-790 WRA in Volta Region. EAs were chosen by systematic sampling from a list of EAs ordered by the number of WRA recorded in the 2000 census, with probability proportional to size (PPS)¹⁴. One hundred clusters per region were required to achieve the sample size (calculated below).

To match the DHS cluster household survey design and its calculated sample size design effect¹², at least fifteen eligible women were interviewed in each EA. If less than 15 eligible women could be found in an EA, women in a randomly-selected adjacent area were sampled. Where EAs contained multiple communities, one was selected at random and the eligible women sampled from it. If the required number of respondents was not obtained from the selected community, the nearest community in the EA was chosen to continue sampling.

Sample size

To measure a change in the proportion of women attending health facilities for delivery from 40% pre-exemption (approximate mean of proportion of deliveries in health facilities in Central and Volta regions from DHS¹²) to 60% post-exemption at 80% power and 5% precision required a total sample size of 107 women per region. To account for the design effect of the cluster household survey¹² and anticipated subsequent levels of analysis (e.g. poverty level or place of delivery) the sample size had to be greatly inflated. The addition of a small margin for rejected questionnaires resulted in a total sample size of about 1500 women per region.

Data collection

Interviewers, who were fluent in the common regional language, were recruited and trained by the researchers. Data collection took place between April and May 2006.

Eligible women in each EA were selected using the following method:

- The EA (or community) was divided into three sections geographically;
- The interviewers paired up and each pair went into one of the sections;
- The pair went to a random house in the section and interviewed any eligible women who lived there;
- They then went from house to house in a random direction until they had achieved the required number of respondents
- If there was more than one eligible woman in a house, all (or up to the required number) of them were interviewed.

As households were chosen at random, the number of deliveries pre and post-intervention was a matter of chance in each cluster. Interviewers approached women with respect and sought informed consent from each woman before completing the questionnaire. On average, an interview took less than five minutes. Women were interviewed using a regional-specific questionnaire comprising two main sections:

1. Personal characteristics including age and education level; and household economy and socioeconomic information including house structure and ownership of goods. These questions were similar to those in the Ghana DHS questionnaire 2003 to enable comparisons of population characteristics and calculation of poverty quintiles^{12,15}.
2. Delivery details: summary information on all deliveries, and detailed information on those deliveries within the specified time period in that region.

Data management, entry and analysis

Data were transferred every weekend from the field sites to Accra. Data were double-entered concurrently by two independent clerks using Epi Info 6. Errors in data entry and data recording were identified using consistency and logic checks, and

followed-up by manual checking of questionnaires.

Analysis was conducted using SPSS v14 and Stata v9, utilizing GLMM. Poverty quintiles were constructed from the asset indicators collected, both consumer articles and characteristics of the dwelling (i.e. type of housing, construction material of floor, roof and walls, type of toilet, source of drinking water, source of lighting, and ownership of goods such as radio, fridge and bicycle), using the principal components method devised by the World Bank¹⁵. This analysis was conducted on each region separately because in preliminary work the two regions were found to have markedly different levels of wealth.

In an initial model, the odds of delivering at a facility were assumed to depend on wealth, education, whether the delivery occurred before or after fee exemption (as fixed effects), and on EA (cluster, as a random effect). Multilevel logistic regression models were fitted to estimate the change in the log-odds of delivery in a facility associated with fee-exemption, allowing for clustering, and controlling for individual or household level variables, education level and poverty quintile. The two levels in the analysis were delivery, which included individual and household level factors (level 1), and EA (level 2).

To examine whether the odds-ratios (ORs) of a facility delivery associated with fee exemption varied with education or wealth, the log likelihoods of the initial models were compared to models also containing interaction terms. A significant change in the log likelihood indicated that the model allowing the effect of fee exemption to vary with education or wealth provided a better fit to the data. The inter-cluster variation in the log-odds of delivering in a facility, for women with the lowest level of education and wealth, and before fee exemption, was estimated.

RESULTS**Description of population**

There were a total of 2,922 respondents from the two regions (1,541 in Central and 1,381 in Volta). The age of the respondents ranged from 15-58 years, with a mean age of 28 years.

gions combined 1298 (42.8%) deliveries took

Table 1 Selected population characteristics

Population characteristic	Central n (%) (Total n=1541)		Volta n (%) (Total n=1381)	
	Before	After	Before	After
Highest level of schooling attended*				
-None	160(25.3)	220(24.2)	231(35.1)	226(31.6)
-Primary	151(23.9)	185(20.4)	121(18.4)	135(18.9)
-Middle/JSS	258(40.8)	405(44.6)	254(38.5)	304(42.5)
-Secondary +	64(10.1)	98(10.8)	53(8.0)	50(7.0)
Type of dwelling*				
-Separate house /semi-detached house/flat/apartment	148(23.4)	195(21.5)	258(39.0)	287(40.0)
-Compound house	482(76.1)	710(78.2)	399(60.3)	430(60.0)
-Other	3(0.5)	3 (0.3)	5(0.8)	0(0.0)
Wall material				
-Stone/burnt bricks/Cement/concrete	429 (67.8)	636(70.0)	296(44.6)	306(42.6)
-Mud/mud bricks/earth/landcrete	189(29.9)	251(27.6)	355(53.5)	399(55.6)
-Other	15 (2.4)	21(2.3)	12(1.8)	13(1.8)
Type of toilet*				
-WC/Private KVIP	149(23.6)	210 (23.1)	104 (15.7)	116 (16.2)
-Pit latrine/bucket/pan	85(13.4)	121 (13.3)	169 (25.5)	199 (27.8)
-Public toilet/toilet in another house	300(47.4)	416 (45.8)	217 (32.7)	201 (28.0)
-No facility (bush/ beach /field)/other	99(15.6)	161 (17.7)	173 (26.1)	201 (28.0)
Source of drinking water*				
-Pipe-borne inside/ mineral/sachet	85 (13.4)	130 (14.3)	23 (3.5)	21 (2.9)
-Pipe-borne outside/tanker	447 (70.6)	636 (70.0)	313 (47.3)	337 (47.0)
-Well/borehole/rain /open water	101 (16.0)	142 (15.6)	326 (49.2)	359 (50.1)
Source of lighting*				
-Electricity	428 (67.6)	625 (68.8)	282 (42.6)	294 (40.9)
-Kerosene	202 (31.9)	283 (31.2)	375 (56.6)	422 (58.8)
-Other	3 (0.5)	0 (0.0)	5 (0.8)	2 (0.3)

*In Volta Region totals for population characteristics less than the population total are due to missing values.

Table 1, presenting some of the socioeconomic characteristics measured, shows that respondents in Central Region tended to be better educated and wealthier than respondents in Volta Region. About half of respondents in both regions had attended Middle School or Junior Secondary School (JSS), but only about one in ten respondents had ever attended secondary school. More women in Volta Region (about a third) than in Central Region (about a quarter) said they had received no education at all. A number of other socioeconomic indicators such as structure of housing, type of toilet, water supply and source of lighting suggest that respondents from Central Region were wealthier than respondents from Volta Region. Table 1 also shows there were minimal socioeconomic differences in the populations between the before and after periods.

Delivery characteristics

The 2,922 respondents had 3,035 deliveries during the two study periods. Table 2 shows the delivery characteristics of the respondents. In the two re-

place before fee exemption while 1,737 (57.2%) took place after the intervention was implemented.

In both regions the most commonly reported place of delivery was at home. More deliveries took place at home in Volta Region (49.3%) than Central Region (32.9%). The most commonly-reported health facility for place of delivery was hospital, with a similar level of reported use in both regions (30.2% in Central Region and 32.5% in Volta Region). Deliveries in health centres and clinics were more frequently reported in Central (~25%) than in Volta (~14%). Midwives were the most common health professional to attend deliveries in both regions (55.6% in Central Region and 49.3% in Volta Region). In Central Region deliveries were more frequently attended by TBAs (32.6%) than in Volta Region (25.8%), while in Volta Region deliveries attended by friends or relatives were much more frequent (20.3%) than in Central Region (4.4%). Overall, deliveries more commonly took place in health facilities or with a health professional in Central Region, and were more likely to

be at home and attended by family in Volta Region.

Table 2 Delivery characteristics

Delivery characteristic	Central n (%) (Total n= 1654)	Volta n (%) (Total n= 1381)
Timing of deliveries		
-Before implementation of fee exemption	635 (38.4)	663 (48.0)
-After implementation of fee exemption	1019 (61.6)	718 (52.0)
Place of delivery		
-Hospital	499 (30.2)	449 (32.5)
-Health centre	314 (19.0)	179 (13.0)
-Clinic	112 (6.8)	18 (1.3)
-Traditional Birth Attendant's (TBA) home	102 (6.2)	33 (2.4)
-Own home/other's home	544 (32.9)	680 (49.3)
-Other	83 (5.1)	22 (1.6)
Person attending (most medically qualified)		
-Doctor	74 (4.5)	71 (5.1)
-Midwife	919 (55.6)	598 (43.3)
-TBA	540 (32.6)	356 (25.8)
-Relative/friend	72 (4.4)	280 (20.3)
-Nobody	34 (2.1)	71 (5.1)
-Other	15 (0.9)	5 (0.4)
Place of delivery (summarized)		
-Health facility	976 (59.0)	665 (48.2)
-Not health facility	678 (41.0)	716 (51.8)
Person attending (summarized)		
-Health professional	993 (60.0)	669 (48.4)
-Not health professional	661 (40.0)	712 (51.6)
Deliveries attended by health professional but not in health facility	17 (1.7)	8 (1.2)

The vast majority of deliveries attended by health professionals took place in health facilities in both regions. Because of this strong association between delivery in a health facility and attendance by a health professional, it was decided that for subsequent analysis it was not necessary to analyse comprehensively place of delivery and person attending separately. Hence, results will be mainly presented for place of delivery only, with separate

results for person attending shown only as required.

Place of delivery and person attending

The proportions of deliveries taking place in health facilities increased after fee exemption in both regions. In Central Region deliveries in health facilities increased by 11.9 percentage points (Figure 1). The increase in proportion of deliveries occurring in health facilities in Volta Region after the implementation of fee exemption was much smaller (5.0 and percentage points).

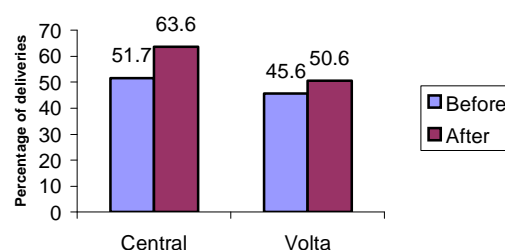


Figure 1 Proportion of deliveries in health facilities before and after implementation of fee exemption, by region

Table 3 Place of deliveries in Central and Volta regions

Region	Place of delivery	n (%)	
		Before	After
Central	Hospital	183 (28.8)	316 (31.0)
	Health centre	87 (13.7)	227 (22.3)
	Clinic	59 (9.3)	107 (10.5)
	Home/Other	306 (48.2)	369 (36.2)
Volta	Hospital	202 (30.5)	247 (34.4)
	Health centre	79 (11.9)	100 (13.9)
	Clinic	22 (3.3)	17 (2.4)
	Home/Other	360 (54.3)	354 (49.3)

Detailed examination of place of delivery showed that hospitals were the most commonly used health facility for deliveries in both regions, both before and after the implementation of fee-exemption (Table 3). The table shows that the increase in the proportion of deliveries taking place in health facilities in Central Region during fee exemption, illustrated in Figure 1, was mainly due to an increase in health centre deliveries. Changes in the pattern of place of delivery were much smaller in Volta region but showed similar increases in both hospitals and health centres.

Table 4 shows that midwives were the most frequent attendant of deliveries in Central and Volta

regions both before and after the implementation of fee exemption. There were more deliveries attended by friends and relatives in Volta Region than in Central Region both before and after the implementation of fee exemption. The proportion of deliveries attended by a health professional increased in Central Region after the implementation of fee exemption. This was due to an increase in deliveries attended by midwives from 49.0% pre-exemption to 59.7% during exemption; with a corresponding decrease in deliveries attended by TBAs. Changes in person attending deliveries were much smaller in Volta region, and apparently affected all categories.

Table 4 Person attending deliveries in Central and Volta regions

Region	Person attending	n (%)	
		Before	After
Central	Doctor	27 (4.3)	47 (4.6)
	Midwife	311 (49.0)	608 (59.7)
	TBA	243 (38.3)	297 (29.1)
	Nobody	12 (1.9)	22 (2.2)
	Friend/relative	42 (6.7)	45 (4.4)
Volta	Doctor	30 (4.5)	41 (5.7)
	Midwife	273 (41.2)	325 (45.3)
	TBA	173 (26.1)	183 (25.5)
	Nobody	38 (5.7)	33 (4.6)
	Friend/relative	149 (22.5)	136 (18.9)

Place of delivery before and after implementation, by education or poverty level of mother

Table 5 shows the proportion of deliveries taking place in a health facility before and after the implementation of fee exemption in Central and Volta regions, stratified by education level and poverty level of the mother. Both regions show trends towards increasing use of health facilities with increasing education of the mother or household wealth, and these were found to be significant ($p < 0.001$) in separate analyses (not shown).

In both regions, and for all education levels (except women with no education in Volta Region), there was an increase in the proportion of deliveries taking place in health facilities after the implementation of fee exemption. In Central Region the biggest relative change occurred for women who had no education (an increase of 16.4 percentage points). In Volta region the largest increase in health facility deliveries occurred for women who had primary level education (10.2 percentage points).

In both regions, for every poverty quintile, there was an increase in the proportion of deliveries in health facilities after the implementation of fee exemption. In the Central Region the largest increase in health facility deliveries occurred among the second poorest quintile (from 35.5% to 55.6%, an increase of 20.3 percentage points). In Volta Region the largest increase was among the poorest fifth of the population, where the proportion of deliveries in health facilities nearly doubled from 12.4% to 23.8% after the implementation of fee exemption.

Table 5 Place of delivery by education level of mother, before and after implementation of fee exemption

Region	Level	Delivery in health facility n (%)	
		Before	After
Central	No education	56 (34.8)	126 (51.2)
	Primary	64 (42.4)	111 (52.4)
	Middle/JSS	153 (59.1)	314 (69.0)
	Secondary +	55 (85.9)	97 (91.5)
	1 (poorest)	50 (35.7)	91 (40.4)
	2	65 (35.5)	158 (55.8)
	3	43 (49.4)	97 (65.1)
	4	77 (67.5)	133 (78.2)
	5 (richest)	93 (83.8)	169 (88.0)
	Volta	No education	66 (28.6)
Primary		45 (37.2)	64 (47.4)
Middle/JSS		149 (58.7)	192 (63.2)
Secondary +		40 (75.5)	42 (84.0)
1 (poor)		17 (12.4)	40 (23.8)
2		42 (28.4)	50 (33.8)
3		55 (51.4)	57 (55.9)
4		101 (62.3)	105 (62.5)
5 (rich)		84 (80.8)	108 (85.0)

The relative difference in level of delivery service use between the most and least educated women decreased in Central region after fee exemption implementation (-10.8 percentage points), yet increased in Volta region (8.8 percentage points). The difference in the level of delivery service use between the poorest and richest women was unchanged in Central region after fee exemption implementation but decreased in Volta region (-7.2 percentage points).

Estimate of changes in place of delivery after fee exemption

After adding the interaction terms there were no changes in the log likelihood for each model.

Table 6 Multi-level model of the change in likelihood of delivery in a health facility after fee exemption controlling for mother's education and poverty level

Central Region	Individual level	Delivery in health facility OR (95% CI)	
		Unadjusted	Adjusted
(n=1654)	Before	1.00	1.00
	After	1.82(1.45, .30)***	1.83(1.44, 2.32)***
Education level	None		1.00
	Primary		1.03(0.74, 1.43)
	Middle/JSS		1.78(1.33, 2.39)***
	Secondary+		4.93(2.74, 8.85)***
Poverty quintile	1 (poorest)		1.00
	2		1.71 (1.02, 2.85)*
	3		2.12 (1.26, 3.58)**
	4		2.99 (1.75, 5.11)***
	5 (richest)		6.31 (3.59, 11.11)***
	Cluster level variance (SE)	1.20 (0.26)***	0.60 (0.16)***
Volta Region(n=1381)	Before		
	After	1.00	1.00
		1.33 (1.01, 1.74)*	1.34 (1.02, 1.76)*
Education level	None		1.00
	Primary		1.31 (0.88, 1.95)
	Middle/JSS		1.88 (1.31, 2.68)**
	Secondary +		3.40 (1.75, 6.62)***
Poverty quintile	1 (poorest)		1.00
	2		2.50 (1.67, 3.76)***
	3		3.77 (2.35, 6.04)***
	4		6.55 (3.78, 11.39)***
	5 (richest)		11.53(5.25, 25.29)***
	Cluster level variance (SE)	3.14 (0.48)***	1.16 (0.27)***

* p<0.05; ** p<0.01; ***p<0.001

Therefore, only the main effect variables were used in the multilevel analysis.

Table 6 shows that there was a significant increase in the odds of delivering in a health facility in both Central (OR 1.83 (1.44, 2.32)***) and Volta (OR 1.34 (1.02, 1.76)*) regions after fee exemption implementation when adjusting for education and poverty level of the mother and in the presence of significant inter-cluster variation. This change in likelihood was the same as the unadjusted model, although the inter-cluster variation was lower.

DISCUSSION

This study found there was a significant increase in the likelihood of delivering in a health facility after the implementation of the fee exemption pol-

icy taking into account the clustered nature of the data, and the poverty level and education level of the respondents.

Descriptive analysis showed the proportion of deliveries in health facilities and attended by a health professional increased both in Central and Volta regions after policy implementation, but the changes were smaller in Volta Region. In Central Region the changes were mainly due to an increase in the number of deliveries in health centre and attended by midwives, with a corresponding decrease in deliveries attended by TBAs. There are a number of possible reasons why the changes in the proportion of deliveries in a health facility or attended by a health professional were smaller in Volta Region. It might be that the shorter duration

of implementation of the policy in Volta Region compared to Central Region meant that many women did not know of the policy or had already decided where they were going to deliver their babies. In addition, as Volta Region is more rural than Central Region, although the actual deliveries were free, the cost and difficulty of getting to a health facility would have been greater, thus delivery at home would likely be preferable.

The reduction in the overall within-region differentials in health facility deliveries between the highest and lowest levels of education and wealth suggest that the implementation of fee exemption helped to reduce inequality in service use. Although no significant interactions between place of delivery and education or poverty level of the mother were found, such tests lack statistical power so do not contradict the effect observed¹⁶.

As these results suggest that the fee exemption policy particularly assisted some groups of the population who were likely to have the biggest financial barriers in delivering in health facilities, this may have resulted in reduced maternal mortality and morbidity. The proportion of deliveries in facilities is in general inversely linked to maternal mortality¹⁷, and the association between poverty or low education and higher maternal mortality¹⁸ has been attributed to underutilization of maternal health services¹⁹. Therefore, it seems reasonable to suppose that the fee exemption policy improved maternal health, assuming the increased utilization did not result in deterioration in quality of care.

The PPS and cluster sampling methods allowed a random sample of the population to be practically surveyed without the requirement for a complete list of individuals, the sample was self-weighted by population size, and all women theoretically had an equal chance of being selected. As a greater population size is likely to mean more health services and easier access, and therefore greater utilization¹⁸, listing the EAs by size meant a spread of cluster sizes would be selected, and therefore a range of levels of utilization of health services was likely to have been captured²⁰. The analysis accounted for the clustered nature of the data, thus improving the accuracy of the estimate of the changes in proportion of deliveries occurring in health facilities.

It was not possible to assess accurately the representativeness of the sample as the most recent census was conducted in 2000 and there were few

other comprehensive contemporary population survey reports available.

The 2005 RCH report for Central Region reported that a doctor or midwife at a service delivery point attended 49.7% of all deliveries in the region. Although the levels reported here are lower than those found in this survey, it is possible that the survey methods used account for the differences. This survey was only carried out in six districts of Central Region. Similar RCH data for Volta Region were not readily available to allow comparisons.

The regional dates of implementation of the fee exemption policy used were taken from earlier work¹¹. However, this work revealed varying implementation dates by districts within the two regions, and some intermittent fee exemption implementation. It was not possible to incorporate district-level details into the design of this survey and so some misclassification of exposure to fee exemption was likely in some districts. This may have particularly affected the results from the Volta Region where the 'before' and 'after' periods were each only six months duration, and so variations in implementation at district level by as little as a month either way could have meant a substantial proportion of respondents were misclassified.

The number of deliveries in the 'after' phase in Central Region was 60% higher than in the 'before' phase. Reasons for this difference are unknown but it is possible that mothers of older children would be less likely to be at home at the time of interview than mothers of younger children. This observed difference in the distribution of the sample would only affect the association between intervention and place of delivery if women's availability for interview was related to their place of delivery differently in the two phases; this would be unlikely.

This study analysed observational data by comparing data relating to a later period (after the introduction of the intervention) to data relating to an earlier period (before the intervention). The inferential strength of the study is therefore relatively weak, so that any associations found could be the result of a pre-existing temporal trend, for example, or even be an artefact due to differential recall. Although this survey cannot directly attribute the changes in the place of delivery and person attending to the fee exemption policy, the results do demonstrate that changes occurred at the time of

implementation, and these results alongside evidence from the other components of the evaluation strengthen the ability to attribute any change to the intervention.

Further work could compare these population reports of delivery service utilization with facility reports of the same time period.

CONCLUSION

This study showed that after the implementation of fee exemption in Central and Volta regions there was a substantial and statistically significant increase in the likelihood of delivering in a health facility, although the changes seen may be due to factors other than the fee exemption policy. The increase in the proportion of deliveries occurring in health facilities was higher for poor and less educated women, i.e. groups of the population that are likely to have the greatest financial barriers to health care. However, the association between increased uptake and poverty observed was not strong enough for interaction to be detected. The effects of the increased utilization of delivery services on the health of the mothers and their children could not be determined from this study. However, evidence from other studies suggests that the increased service utilization shown, particularly that which occurred in the more deprived groups of the population who are more likely to suffer maternal mortality or morbidity, are likely to result in improved maternal health.

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