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Testing for Moral Hazard in Caesarean Section in the Ghanaian National Health Insurance Scheme; an Approach using Matching Estimation

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Abstract

Health care financing scheme in Ghana is now switching from out- of- pocket payment system to a prepayment system. The reason for the switch is the impoverishing effect of the out of pocket system. Under the prepayment system, registered members can have access to health care without any financial obligation. There is thus some incentive for members to over- utilize health care. This study used maternity data to test for the existence of moral hazard in the demand for caesarean section. The matching estimation approach used was able to randomize the data and so make unbiased comparison of insured and uninsured patients possible. The results showed that moral hazard exists. In addition the study also found a high correlation between caesarean section and the National Health Insurance regardless of the risk type of patient. The study made some recommendations to discourage unnecessary caesarean section and help improve the efficiency in the operation of the scheme.

Introduction

In the 1980s and 1990s, many African countries introduced user fee in public health care facilities to help raise revenue for the operation of the facilities (Burnham et al., 2004). The impoverishing effect of the out of pocket payment mechanism as well as the current widespread attention to poverty reduction has prompted several countries including South Africa, Zambia and Uganda to remove such user fees (McIntyre, 2007). There is now a trend towards a prepayment mechanism to replace the out of pocket payment system. This trend has been strengthened by the 2005 World Health Assembly resolution which encouraged Member States to adopt social and other forms of health insurance (McIntyre, 2007).

Ghana is a leading country in Africa to take steps towards a mandatory health insurance system. The prepayment system has the advantage of allowing registered members access to health care regardless of their financial situation at the time of illness. Such a system is efficient in that it transfers risk from the risk averse, (the consumer), to the risk neutral, (the government). The system also transfers resources from the rich and healthy to the poor and unhealthy. The strong public support for the system implies that such a transfer is consistent with society's preference and so is efficient. However, a problem with the prepayment system is moral hazard which results in inefficient increase in the cost of care. The purpose of this study is to use Ghanaian maternity data to test for moral hazard in caesarean section (CS) as a result of the Ghanaian National Health Insurance Scheme (NHIS).

The Ghanaian National Health Insurance

The NHIS was introduced in Ghana towards the end of 2004 after several years of a user fee system called the Cash and Carry system. The Cash and Carry system reduced health care utilization and caused financial burden on households. In a national survey by Ghana Statistical Services in 2003, the Core Welfare Indicators Questionnaire revealed that, health care utilization rate fell from 22% in 1997 to 18% in 2003(Ghana Statistical Service, 2003). Among the important indicators of a nation's health status is maternal

mortality and morbidity rates. The Cash and Carry system, because it reduced the utilization of health care (Gilson, 1988) could have contributed to the high maternal mortality and morbidity rates. For example, Martey et al. (1994) estimated maternal mortality of 211 per 100,000 live births in 1986 and 235 per 100,000 live births in 1989 for Ejisu district in Ghana. These estimates are not different from the national average rate of 210 per 100,000 live births for 1990-2005 estimated by UNICEF (UNICEF, 2006).

The introduction of the NHIS has given all registered maternal patients free access to prenatal care as well as in hospital delivery. Patronization of the scheme has been slower than expected nevertheless the scheme has enough public support for survival. About 33 percent of the population has now registered with the scheme and some private hospitals have accreditation to care for NHIS patients (NHIS, 2011). Education of the general public remains important to ensure full participation of the public. To ensure reduction in the high maternal mortality, the government introduced free maternal care to all patients in NHIS accredited health facilities in 2003 in selected regions of the country. By mid-2008, however, the policy had been extended to the whole country (Adjei and Owusu , 2008). All pregnant women now are automatically enrolled in the NHIS and so have free access to normal delivery, as well as assistant delivery including CS and the management of all medical complications arising from deliveries (Ofori-Adjei, 2007). However, to find out the effect on moral hazard, the data used for the study focused on the period before the free maternal delivery program.

Moral Hazard

According to economic theory, the reduced price faced by an insured health care consumer induces an increase in the purchase of health care. This increase is called moral hazard and the efficiency of moral hazard depends on whether it is due to income or substitution effect from the fall in price (Nyman, 2004). While moral hazard from income effect is efficient, that from substitution effect is not efficient and some economists argue that demand side cost sharing policies to reduce moral hazard should only target

the inefficient part of moral hazard (Nyman, 2004). The inefficient part of moral hazard, also referred to as hidden action involves a change in the behavior of the insured in a way that causes waste (Cutler and Zeckhauser, 2000). Because insurance reduces price at the point of purchase, the patient may have the incentive to substitute other goods for health care which is relatively cheap. Such a behavior is not efficient because the actual price of health care may not have fallen. For example an insured patient may choose more expensive treatment when there are less expensive and equally effective treatment options available. In the case of maternity, inefficient moral hazard occurs when a patient that does not require CS demands it as a result of the low price. The patient in this case substitutes vaginal delivery for CS. Note that under full insurance as in the NHIS, the prices of CS and vaginal delivery are both zero but with CS the patient does not have to undergo the labour pain, thus making CS cheaper than vaginal delivery to the patient.

Previous Studies

Various studies have shown that there is a high positive correlation between CS and maternal age, level of maternal education, obstetric complications, as well as previous CS (Barros et al., 1991, Wagner, 2000; Zahniser et al., 1992). Other factors that also influence CS include supplier induced demand (Alran et al., 2002). Studies have also shown that high income women (whether insured or not) are likely to request for CS in order to, among others, avoid labour and delivery pain as well as keep the anatomy and the physiology of the vagina and the perineum intact (Mossialos et al., 2005; Robert et al., 2000).

This could partly explain the high incidence of CS in rich countries than poor countries and among rich individuals than the poor. For example CS makes up about 19% and 23% of all deliveries in the UK and the USA respectively (Mayor, 2002; Francome et al., 1993). CS rates in developing countries can be as low as 4.18%, 0.66% and 4.19% in Ghana, Burkina Faso, and Kenya respectively in 2003 (Ronsmans,

2006). However, Sulzbach et al (2005), using pre NHIS Ghanaian data, found that women that were insured with the Community Based Health Insurance had much higher rates of caesarean than the uninsured. A high correlation between NHIS and CS could be due to moral hazard and hence threaten the sustainability of the Scheme. It is therefore important to test the extent to which the NHIS could be correlated with CS. And this was done in this study using matching estimation method.

Methodology

The Rationale for using the Matching Estimation

Comparing women who have health insurance with those without health insurance can be a challenge because of the problem of selection bias. This is especially true when insurance is voluntary as in the case of the NHIS. Those who purchase NHIS may have some unobserved characteristics that could affect their decision to choose CS. High risk consumers are likely to purchase insurance (Rothschild and Stglitz, 1976). When child birth is taken into account it is also possible for low risk women at child bearing age who want to avoid prolonged labour to purchase health insurance. Ignoring such adverse selection can bias the results of any comparison of the two groups. For example, since high risk women are likely to require CS, the possible high proportion of high risk women in the insured group could result in the overestimation of any moral hazard that may exist.

In the standard regression, instrumental variable estimation is used to purge the health insurance variable from any of the unobserved characteristics in order to randomize the data for valid comparison. Previous studies have argued that variables that are related to the individual's risk aversion are the best instrument (Bago d'Uva & Santos-Silva, 2002). Such an instrument would be highly correlated with the decision to purchase insurance but uncorrelated with the unobserved characteristics. Variables like this, however, are yet to be found.

The present study thus avoided the problem of finding an instrument by using propensity score approach for

matching estimation. Propensity score helps randomize the data to validate comparison of any two groups. In this study the treatment group was those with NHIS; the control group was those without NHIS, and the outcome was whether or not she delivered by CS.

Method Description

The treatment group of interest was maternity patients with NHIS and the control group was maternity patients without NHIS. CS was the outcome of interest. With the help of a nurse midwife, the patients were grouped into high risk, medium risk and low risk. A patient was classified as high risk if she had Caphalopelvic disproportion, ocipito-posterior presentation, previous CS, eclampsia, cord prolapse, intrauterine death, post datism, APH, and/or prolonged prom. A medium risk patient had fetal distress, traverse lie, breech, cervical dystoxia, oblique lie, macerated baby, mal-presentation, compound presentation, and/or baby was born before arrival at the hospital. Classifying the data according to risk makes matching easy because high risk patients are systematically different from those of other risk types. It is thus easier to reach a balance with patients of a particular risk type than those of different risk type. The patients with NHIS were matched with those without NHIS in each risk group.

To match the samples, a logistic regression of a dummy variable for NHIS was run, for each group, on a list of covariates on the patients was run. The dummy for NHIS equaled one if the patient had NHIS and zero otherwise. The validity of matching requires that the covariates included in the model simultaneously affect treatment assignment and outcome (Heckman et al., 1997). This is to satisfy the ignorable treatment assignment assumption which states that assignment to treatment is associated with only observable pretreatment variables (Heckman and Robb, 1985; Holland 1986). In addition the variables should not change as a result of the assignment to treatment (Caliedo and Kopeing, 2005). This implies that the covariates used in the model should influence both the decision to register for the NHIS and the likelihood of undergoing CS. Such

variables do not change after one has purchased insurance.

The covariates used for the logistic regression then were age of mother, year of delivery, (2006 or 2007), and area of residence, i.e., whether the mother lived in a rural area, a small town or in a city. There was no information on the patient's income or education level and so the area of residence was used as a proxy for income and education.

Age satisfies the two conditions for the validity of covariate. All things being equal, an older mother is more risk averse than a younger mother, since risk aversion is likely to increase with age (Albert and Duffy, 2012). Simultaneously the likelihood of caesarean increases with age and one's age does not change with insurance.

The justification for the inclusion of the year of delivery comes from peoples' attitude towards the NHIS and CS. There is likely to be a higher patronage to the NHIS in 2007 than 2006; and the increased patronage could also affect the demand for caesarean in the two years.

The mother's area of residence is an important variable. Mothers who live in a city are likely to have access to information on NHIS, be literate and/or could have access to income relative to those in small towns and rural areas. Those in rural areas are the least likely to be literates, have access to information on NHIS, and/or have access to high income. As already explained women with high income are likely to request for CS than those with low income. Thus women who live in the cities are most likely to request for CS while rural women are least likely to do so. It is also likely for women in the cities to purchase NHIS than those in rural areas. It is true that some villagers or some women in small towns could be more educated and have higher income than those in the cities. However, on average city women are more educated and have higher income than small town women who are also more educated and have higher income on average than rural women. Using patients' area of residence as a proxy for their income and education is similar to using the median income and the level of education of patients' local health areas as proxies for income and education

respectively as done in the literature (e.g., Heggestad, 2002; Amporfu, 2008). Nevertheless, the lack of actual information on mothers' parity, education, and income could still be a limitation to the study. Where area of residence does not proxy well, the absence of such variables could bias the results of the regression.

To follow the standard matching procedure, the logistic regression was used to compute for each observation the predicted probability referred to as propensity scores. The propensity scores were used to match the patients of each risk type. The nearest available matching on the estimated propensity score method, as outlined in Rosenbaum and Rubin (1985), was used to match the patients in each class. Under this method, the patients in both the control and treated groups are randomly ordered. Individual patients in the treatment group were then paired with individual patients in the control group that had the closest propensity scores. The patients from either group whose propensity scores could not be matched were removed from the sample. Thus matched patients of a given risk type would have balanced covariates and this balance was tested by a two sample *t*-test. If balance was not achieved the covariates were modified and the propensity scores re-estimated. This is repeated until a balance is achieved. The probability of delivering by CS was then computed as a percentage of CS delivery in the in the treatment as well as the control group and compared.

Since the interest of the study is to find the existence of moral hazard, the low risk group was the target group. A low risk pregnant woman who requests for CS is likely to do so before the time for delivery. Since doctors care about their leisure, (Mossialos et al., 2005), such a CS, if the doctor grants the request, is likely to be performed during regular working hours. Thus the low risk group who delivered between 8:00 am and 2:00 pm on weekdays were used to measure moral hazard. Following Missialos et al, (2005) the CS performed during weekday regular hours was referred to as planned CS and the rest were referred to as unplanned CS. The definition of a 'planned CS' here is better than that in Missialos et al (2005) where the definition was only based on set time

and not on patient risk type. This is because CS, which is medically necessary, could also be planned for high risk patients. Thus, planned CS for the low risk is more likely to be unnecessary than that for the high risk.

Data

The study data were obtained from patients' records on all maternity cases in a mission hospital from 2005-2007. Even though the NHIS was introduced in Ghana in 2003, the mission hospital under study did not accept NHIS patients till 2006. Since the interest of the current study was on delivery and the use of NHIS, data on cases in 2005 were all discarded. This was to avoid any possible bias that could occur as a result of the existence of hospital policy in 2005 which could affect delivery method. For the remaining period, records that did not cover delivery were also discarded. The removal of the irrelevant data reduced the sample size from 4,520 to 1,705. The 1,705 included all deliveries in the hospital in 2006-2007.

The data has several advantages in testing for moral hazard. First, that the payment scheme used for doctors does not encourage inducement. Medically unnecessary CS could be either due to moral hazard or physician inducement. Physicians have the incentive to induce CS if there is financial gain or if they are specialists such as gynecologists or obstetricians. These incentives do not exist in the data used for the current study. Physicians in the hospital under study, are salaried and do not receive any additional fee for complicated procedures like CS. Besides, CS in the hospital is performed only by general practitioners who are likely to use less intrusive procedure than gynecologists. There is thus no or low incentive for physicians to induce demand for CS. Patients however are allowed to demand CS as long as they can pay either personally or through insurance. Thus any unnecessary performance of CS is likely to be from the patient than the physician.

Second, all the patients are from the same hospital. This removes the problem of selection bias that could result from hospital choice. Severely ill patients are likely to choose high quality hospital and so selection bias could exist in data that contain patients' records from more than

one hospital (Gowrinsankaran and Town, 1999). Such a selection bias could not be a problem in the current data because the data came from only one hospital. The patients did not regard the hospital as a monopoly because its location is only a few kilometers from the district hospital and patients from both the rural and urban areas had the option of other public hospitals that also accept the NHIS patients. The patient therefore must be homogenous in expecting high quality of care from a mission hospital. Thus the study could only focus on the selection bias that could result from the choice of NHIS. There was thus no need to match the patients first according to the hospital of delivery before matching them according to whether or not they have NHIS.

Third, even though the hospital is located in a small town, it is only a few kilometers from Kumasi, the second largest city in Ghana. Thus the hospital is able to attract patients from rural as well as urban areas. And the proportion of patients attracted from these areas is similar to the national proportion thus making the data and the results a good representation of the country.

Results and Discussion

Data Description

Table 1: Data Summary

	Without NHIS	**With NHIS**	**Total**
Sample size	1,544	161	1,705
Average age	26.7	28.5	26.9
Percent rural	42.0	39.1	41.7
Percent in small towns	26.9	29.2	27.2
Percent in cities	31.1	31.7	31.1
Percent high risk	10.2	9.3	10.1
Percent medium risk	7.3	2.5	6.9
Percent CS delivery	17.4	30.4	18.7
Percent of CS planned	18.8	40.6	20.6
Percent of CS unplanned	17.0	27.9	18.1

Table 1 shows that less than 10 percent of the patients had NHIS. This is much below the 38 percent of the national registration of the NHIS. The average age is below 30 years, for both those with and without NHIS. Except for a

slight majority of the patients in rural areas, in general the patients are evenly distributed among the three areas: villages, small towns and cities. The percentages of high and medium risk patients among the NHIS patients are less than those of the patients without NHIS.

The percentage of those who underwent CS is much higher among the NHIS patients than those without NHIS. The overall percentage of CS is much higher than the national percentage which is less than 10. The data also shows that CS was slightly more likely to be planned than unplanned and a planned CS was more than twice as likely to be for an NHIS patient as non-NHIS patient. Similarly, unplanned CS was more likely (but less than twice as likely) among NHIS patients than non-NHIS patients. Thus a patient is likely to receive CS if insured whether the CS is planned or emergency. This is contrary to Missialos et al. (2005), where the likeliness of unplanned CS did not differ much between insured and uninsured patients. The high percentage of planned CS for NHIS patients does not necessarily imply moral hazard because the procedure could be medically necessary for the patients. To find moral hazard this study focused on planned CS for low risk patients.

Table 2a: Low Risk who Delivered During Regular Hours: Comparison of the Two Groups Before Matching

	Without NHIS $N = 286$		With NHIS $N = 31$		Comparisons	
	Mean	SD	Mean	SD	Two sample *t*-statistic	p-value
Age	27.1	6.008	28.19	5.382	-0.971	0.332
2006	0.67	0.471	0.26	0.445	4.668	0.000
2007	0.33	0.471	0.74	0.445	-4.668	0.000
Lives in rural area	0.43	0.496	0.45	0.506	-0.192	0.848
Lives in a city	0.30	0.459	0.39	0.495	-0.987	0.324
Lives in a small town	0.27	0.442	0.16	0.374	1.266	0.207
Propensity score	0.091	0.078	0.165	0.081	-5.034	0.000

Results and Discussion of the Matching Estimation

For all the risk types, group balance was achieved after one matching and so further transformation of the covariates was unnecessary. In the case of the high and medium risk patients, there was not enough data to match patients who delivered during regular hours. There was only one high risk NHIS patient who delivered during working hours and none for medium risk. Even when deliveries outside regular working hours were included, the treatment group (NHIS patients) for the medium risk had only four patients which reduced to three after matching. That of the high risk reduced from 15 to 13 after matching. The matched sample sizes were thus too small for reliable conclusions to be drawn for the population. The results were thus not reported.[1] The probabilities of CS for the two groups are however reported in Table 4. The matching results reported are only on the low risk patients who delivered during weekday working hours and those who delivered outside working hours. The planned and the unplanned CS patients respectively belong to the two groups

[1] The author will be happy to produce the results upon request.

Table 2b: Low Risk who Delivered During Regular Hours: Comparison of the two Groups After Matching

	Without NHIS *N* = 24		With NHIS *N* = 24		Comparisons	
	Mean	SD	Mean	SD	Two sample *t*-statistic	p-value
Age	28.25	4.839	28.29	4.921	-0.030	0.977
2006	0.33	0.482	0.33	0.482	0.000	1.000
2007	0.67	0.482	0.67	0.482	0.000	1.000
Lives in rural area	0.54	0.509	0.54	0.509	0.000	1.000
Lives in a city	0.33	0.482	0.33	0.482	0.000	1.000
Lives in a small town	0.13	0.338	0.13	0.338	0.000	1.000
Propensity score	0.152	0.082	0.152	0.082	-0.002	0.999

The results from matching the low risk patients who delivered during and outside working hours are respectively reported in Tables 2a to 3b. With the exception of the area of residence, the NHIS and the non- NHIS groups were statistically different from each other in terms of the covariates. This can be seen in the high p-values for the covariates on patients' areas of residence and low p-values for the other covariates. The high p-values for the patients' areas of residence mean that the proportions of patients from the three areas of residence are similar in the two groups. They however differed in the other covariates and so matching was necessary to balance the data. The results in Tables 2b and 3b show that balance occurred after the first matching; inclusion of transformed covariates were thus not required.

Table 3a: Low Risk who delivered outside regular hours: Comparison of the two Groups Before Matching

	Without NHIS *N* = 998		With NHIS *N* = 111		Comparisons	
	Mean	SD	Mean	SD	Two sample *t*-statistic	p-value
Age	26.58	5.660	28.54	5.847	-3.728	0.000
2006	0.74	0.440	0.52	0.502	5.284	0.000
2007	0.26	0.440	0.48	0.502	-5.284	0.000
Lives in rural area	0.41	0.492	0.38	0.487	0.641	0.522
Lives in a city	0.32	0.466	0.30	0.461	0.345	0.730
Lives in a small town	0.27	0.446	0.32	0.467	-1.060	0.289
Propensity score	0.094	0.053	0.127	0.064	-6.566	0.000

Table 3b: Low Risk who Delivered Outside Regular Hours: Comparison of the two Groups After Matching

	Without NHIS *N* = 104		With NHIS *N* = 104		Comparisons	
	Mean	SD	Mean	SD	Two sample *t*-statistic	p-value
Age	28.78	5.532	28.01	5.295	1.121	0.263
2006	0.59	0.495	0.52	0.502	1.092	0.276
2007	0.52	0.495	0.48	0.502	-1.092	0.276
Lives in rural area	0.41	0.457	0.37	0.485	-1.306	0.193
Lives in a city	0.29	0.470	0.31	0.463	0.316	0.752
Lives in a small town	0.33	0.488	0.32	0.469	0.977	0.329
Propensity score	0.123	0.059	0.123	0.059	-0.040	0.968

The probabilities of delivery by CS were computed as a percentage of CS among the matched patients in each group and are reported in Table 4. The results in Table 4 show that, regardless of the patient's risk type, NHIS patients were more likely to undergo CS than non-NHIS patients. Since the interest in this study was on moral hazard, the analysis focused on low risk patients.

Table 4: Probabilities (%) of CS for Different Risk Groups

	Without NHIS		With NHIS	
	Before	After	Before	After
Low risk planned CS	8.7	20.8	41.9	41.7
Low risk unplanned CS	9.3	8.7	21.6	21.2
Medium risk	49.6	50.0	50.4	50.0
High Risk	39.3	23.1	60.7	76.9

Table 4 shows that it was twice as likely for an NHIS patient to undergo a planned CS compared to a non-NHIS patient. Thus even though the physician may not have any financial incentive to perform CS, she/he is likely to give in to pressure from the patient for CS if the patient has NHIS. Table 4 also shows that unplanned CS is even high among NHIS patients, i.e., even for emergency, NHIS patients were more likely to deliver by CS than non-NHIS patients. This is contrary to Mossiolos et al (2005) where insurance did not have much effect on unplanned CS. The high rate of unplanned CS among the NHIS patients could imply that physicians and/or midwives were likely to

recommend CS for patients who had been in labour for a long time, as long as they had NHIS.

Note that the gap between the planned probabilities of CS narrowed with matching. The matching approach then helped remove any possible exaggeration in the difference in CS rates between the two groups. However, the probabilities of those with NHIS remain higher than those without NHIS whether or not the samples were matched. Since matching removes any bias that could exist in comparing the two groups, comparison of the probabilities of CS between the matched groups is more valid than a comparison of the unmatched groups.

The reason for the high correlation between CS and NHIS might be because Ghana is a developing country. Typically CS rate is low in the country and the reason could be lack of health care personnel or affordability on the part of the patient. In the case of the mission hospital used for this study where personnel were always available, affordability was likely to be the reason for the lower probability of CS among the non-NHIS patients. Unplanned CS for low risk patients is likely to be necessary because they are likely to be performed at the time of delivery when the patient is unable to deliver naturally. However, planned CS for low risk patient is less likely to be necessary and given that the physician has no financial incentive to induce such performance they are likely to be requested by the patient. A physician is likely to give in to such pressure if the patient has NHIS because CS is affordable to such patients.

A normal delivery cost about $40 while CS cost about $300.00 during the study period. Thus the high CS among NHIS patients represents a substantial increase in health care expenditure as a result of the NHIS. This is moral hazard and it could threaten the sustainability of the NHIS. This moral hazard may not necessarily be all inefficient because a high proportion of the NHIS patients who underwent CS could have a very large income effect which led to the significant increase in CS. However, efficiency demands that such patients pay high premium to ensure the sustainability of the NHIS. Such a high

premium is not feasible in practice and so instead any increase in expenditure as a result of moral hazard is spread over all NHIS patients, and hence threatening its sustainability.

The main limitation of the study has been the absence of information on mothers' education level and income. Such a limitation could bias the results. However the use of mothers' residence as a proxy could minimize any possible bias.

Conclusion and Recommendations

The study has shown that there is a high correlation between NHIS and CS regardless of the risk type of patient. The standard policies such as co-payment and coinsurance to curb moral hazard are not feasible in the Ghanaian situation because of possible impoverishing impact on the women. This study proposes two main solutions which involve both the hospital and the government.

First, doctors should be encouraged or even monitored to ensure that they do not succumb to pressure from patients. A patient who requests for CS that is not medically necessary should be made to pay for the cost even if she has NHIS. Such a measure could reduce the increase in demand for CS that may not be medically necessary. The justification for such a solution is that the NHIS was meant for care that is medically necessary. Thus even if the increase in CS is due to income effect and hence efficient, the NHIS does not cover any such increase.

Second, patients may choose CS in order to avoid the excruciating pain of labour. Physicians and midwifes could be encouraged to use analgesic drugs to reduce or remove labour pains and hence reduce the need for patients to request for CS. Prenatal classes could be used as a forum to educate pregnant women on the need to choose vaginal delivery than CS unless it is medically required. For more effective education, government intervention is required to educate the public on the need to choose vaginal delivery whenever possible. The government could launch a vaginal delivery promotion.

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