วารสารสาธารณสุขและการพัฒนา
ปีที่ 7 ฉบับที่ 3 กันยายน - ธันวาคม 2552

Barriers to delivery care by skilled attendants in Sulawesi Utara

F.L. Fredrik G. Langi * Grace Langi**

ABSTRACT

The purpose of the study was to investigate the barriers for women in Sulawesi Utara to accessing a skilled attendant at birth. A secondary data analysis of the 2002/2003 Indonesia Demographic and Health Survey which involved the most recent live birth in the past five years of 428 ever-married women aged 15-49 in Sulawesi Utara was performed. Independent variables were identified by the Andersen behavioral model. Multivariate analysis was conducted with logistic regressions.

By adjusting other factors, mother's educational attainment was the only significant determinant for the use of a skilled attendant. The adjusted adds ratio of the change in birth attendant in women with secondary or higher level of education was 2.58 (95%CI 1.35-4.93). Low educational attainment was a significant barrier for women in Sulawesi Utara to accessing professional delivery care. To improve access, health care authorities and providers need to educate women about their reproductive health and familiarize them with maternal health services.

Keywords Delivery care Skilled attendant Sulawesi Utara

* School of Public Health, Faculty of Medicine, Sam Ratulangi University, Manado, Indonesia

** Health Polytechnic of Manado, Manado, Indonesia

Journal of Public Health and Development
Vol. 7 No. 3 September - December 2009

INTRODUCTION

Maternal mortality remains high in the developing countries [1]. This is in contrast to over two decades of efforts in promoting global safe motherhood. In 2000, world leaders at the Millennium Summit realized this challenge and later agreed to adopt maternal health in the Millennium Development Goals (MDG) [2, 3]. Much earlier, the 1994 International Conference on Population and Development (ICPD) had included maternal mortality reduction in the targets of action [4].

Over the last decade, Indonesia has indeed reduced the maternal mortality ratio (MMR) from over 400 per 100,000 live births in 1991 to 307 per live births in 2002/2003 [5]. This progress followed strenuous efforts by the government during the 1990s to improve maternal health infrastructure. These included initiating the Village Midwife Program, participating in Safe Motherhood and Making Pregnancy Safer Initiatives, and strengthening the foundation of maternal health care through capacity building and legislation [6, 7]. The reduction of MMR, however, is far less than 75% as required by MDG Goal 5 for the period between 1990 and 2015 [2]. With the current MMR figure, Indonesia ranks among the countries with the highest MMR worldwide [1]. A previous study suggests that a slow decline in MMR could be due to barriers to access to maternal health care [8].

Maternal health care consists of antenatal, delivery, and postnatal cares. Delivery care is considered the critical element of maternal health care since most maternal deaths take place during this period [9, 10]. Delivery assisted by a skilled birth attendant, in particular, has been internationally acknowledged to be the most important step in reducing maternal mortality worldwide [11]. Skilled attendants are defined as "people with midwifery skills who have been trained to proficiency in the skills necessary to manage normal deliveries and diagnose or refer complications." [12] Health professionals such as doctors, obstetricians/gynecologists, nurses, and midwives, have been advocated as a proxies for skilled birth attendants in the published literature [6, 13]. When the enabling environment, such as drugs, equipment, supplies, and transport for referral, is available, delivery by a skilled attendant is referred to as a skilled birth attendance [11, 13]. Several researchers, however, do not treat the two terms differently and use both in similar sense to delivery by health professionals [10, 14-17].

A number of factors have been identified as barriers for women to access delivery care by a skilled attendant. These include maternal age of less than 15 or higher than 45 years, high parity, low parental education, large family size, late timing of and inadequate antenatal care checks, and low economic status. Occupation of head of household, certain religions, cost of and distance to health facility, residence and region of the country, and the existence of any delivery complication were also documented to affect women's preference for delivery attendant. [6, 13, 18]. Except for parental educational attainment, however, the significance of these factors was inconsistent in the preceding studies. One

explanation for such inconsistency might be the local factors where the studies were conducted.

Sulawesi Utara, a province in northern Indonesia, is among the regions with a high proportion of deliveries attended by a skilled attendant. The 2002/2003 Indonesia Demographic and Health Survey (IDHS) reported 88.2% of such deliveries in Sulawesi Utara [5]. This figure was the second largest in the country table after that of Jakarta, the capital of Indonesia. It is indeed interesting to evaluate whether women in this area encounter any significant barrier to accessing skilled delivery care. While other provinces of the country can learn from such information, the data can also be used to assess the local factors that might be useful in improving the national proportion of deliveries with skilled attendants. As recorded in the 2002/2003 IDHS, less than 70% of deliveries between 1997 and 2002 were assisted by skilled attendants nationwide. This is substantially less than the Healthy Indonesia 2010 target of 90% [19]. This study was, therefore, conducted to investigate whether any barrier exists for women in Sulawesi Utara to accessing a skilled attendant at birth.

METHODOLOGY

This study was designed as a secondary data analysis of the 2002/2003 IDHS. The IDHS is a national survey that provides health authorities with detailed information about fertility, family planning, childhood and adult mortality, maternal and child health, and knowledge of HIV/AIDS and other sexually transmitted infections. The 2002/2003 IDHS sampled a total of 29,483 ever-married women aged 15-49 of which 1,067 were in Sulawesi Utara. Sulawesi Utara is one of the 26 provinces covered in the survey [5].

The dependent variable was delivery attendant, defined as the most qualified person who assisted delivery, and was categorized into skilled and non-skilled attendants. Skilled attendant referred to a doctor, nurse/midwife, or obstetrician/gynecologist as suggested by WHO [12]. Other attendants, including traditional birth attendants, were classified as non-skilled birth attendants.

Selection of independent variables was guided by the Andersen behavioral model [20-22]. Table 1 summarizes the independent variables. Variable wealth index, in particular, was constructed through the use of several indicator variables in the IDHS questionnaire such as those items about household assets and utility services. The assets were assigned weights using principal component analysis, and then were ordered into quintiles. Lower quintiles indicate poorer condition, while higher quintiles relate to better economic status. Full discussion of the Demographic and Health Surveys wealth index can be found elsewhere.[23] Assessment of each of Andersen's components and categorization of variables followed those of relevant prior studies [6, 13, 14, 21].

Journal of Public Health and Development
Vol. 7 No. 3 September - December 2009

Table 1 Summary of independent variables

Variables	Definition
Predisposing Characteristics	
Mother's age	Mother's age at time of last birth: <20, 20-34, years
Marital status	Marital status at time of survey: married, widowed/ divorced
Birth order	Birth order at last birth (only based on live births): 1, 2+
Household size	Number of household members at time of survey: 4 or less, 5 or more
Mother's education	Highest education level attended: primary or lower, secondary or higher
Father's education	Highest education level attended: primary or lower, secondary or higher
Household head's occupation	Occupation of husband (if married) or of respondent (if widowed/divorced): agricultural worker, others, not working
Religion	Religion of respondent: Christian (Protestant/Catholic), Non-Christian
Timing of the first antenatal check	Time of first antenatal visit for last pregnancy: 1-4 month (early), 5-9 (late/none)
Enabling resources	
Wealth index	Quintiles based on asset factor scores developed in DHS: poorest to poorer, and middle to richest
Cost of health service	Perceived problem of getting money for obtaining health service: small problem, big problem*)
Distance to health facility	Perceived problem of distance to health facility: small problem, big problem*)
Residence	Type of place of residence at time of survey: urban, rural
Need	
Previously terminated pregnancy	Any terminated pregnancy that did not result in a live birth: no, yes
Number of antenatal visits	Number of antenatal visits during last pregnancy: <4 (inadequate), 4+ (adequate)
Complication during pregnancy	Existence of any complication during last pregnancy that needed medical care: no, yes

*) 'No problem' is not applicable

Statistical analysis was performed using Stata version 9.0 (STATA Corporation, College Station, TX, USA, 2005). The unit of analysis was deliveries in the last five years. In the case of multiple births, the analyses were restricted to the most recent delivery. There were 428 women in Sulawesi Utara who gave birth in the five years prior to the survey, and 78 of them had more than one delivery. Data from 2 to 23 women, however, were excluded from the analysis of several variables due to missing responses.

To account for the complex survey design of the IDHS, the analyses were conducted using Stata survey commands which adjust the confidence intervals using Taylor linearized variance estimation. Multicolinearity was assessed using Cramer's V coefficient, tolerance, and variance inflation factor (VIF). VIF of 10 or more was used as a cutoff value for further analysis of interdependence among independent variables.

Association between independent variables and dependent variable was explored with Pearson's chi-square. Independent variables with significant association were then entered into logistic regression analysis. Multivariate analyses were conducted to adjust for confounding effects. Estimated magnitudes of effect were reported as odds ratios and the significance was determined by 95% confidence interval of the estimates. Significant variables in bivariate analyses were offered to the final model. Goodness of fit of the model was assessed with the Archer-Lemeshow test for a logistic regression model fitted using survey sample data [24].

RESULTS

Out of 422 women who delivered babies in the five years preceding the survey, 372 (88.2 %) used a skilled attendant and 50 (11.9%) delivered with the help of a non-skilled attendant. Table 2 presents the characteristics of these deliveries.

Among predisposing variables, mother's age, parental education, occupation of household head, and religion demonstrated a significant association with the choice of birth attendant. Women who used a skilled attendant at their last birth were more likely to be older, Christian and had higher education. They were also more likely to have a partner with equally high education, and come from a family where the household head's occupation was non-agricultural worker. In terms of enabling resources, wealth index and perceived cost of health service were associated with birth attendant preference. Delivery care by a skilled attendant was more likely in wealthier women and those who considered the cost of health service as a small problem. Meanwhile, number of antenatal visits was the only variable among the need factors that showed a significant association with the use of birth attendant. Women with higher antenatal checks had an increased use of a skilled birth attendant.

The determinants of skilled attendants at delivery were evaluated by logistic regressions on birth attendant. Maternal and paternal education, household head's

Journal of Public Health and Development
Vol. 7 No. 3 September - December 2009

Table 2 Characteristics of deliveries with a skilled attendant (n = 428*)

Characteristics	Non-skilled Attendant (n = 56*) n	(%)	Skilled Attendant (n = 372*), n	(%)	P-value of χ^2
Predisposing factors					
Mother's age (years)					
< 20	5	9.9	30	8.5	0.014+
20-34	40	69.5	308	83.1	
> 35	11	20.6	34	8.4	
Marital status					
Married	55	99.0	363	97.9	0.482
Widowed/divorced	1	1.0	9	2.1	
Birth order					
1	19	35.2	139	39.1	0.627
2 or more	37	64.8	233	60.9	
Household size					
4 or less	24	40.9	175	45.6	0.557
5 or more	32	59.1	197	54.4	
Mother's education					
Primary or lower	31	53.5	95	24.7	0.000+
Secondary or higher	25	46.5	277	75.4	
Father's education[a]					
Primary or lower	29	51.7	95	25.8	0.000+
Secondary or higher	26	48.3	274	74.2	
Household head's occupation[b]					
Agricultural worker	37	66.1	149	40.4	0.008+
Others	17	31.8	209	56.6	
Not working	2	2.2	12	3.0	
Religion					
Non-Christian	25	47.8	111	26.5	0.041+
Christian (Protestant/Catholic)	31	52.2	261	73.5	
Women's control over health care decision					
No	3	6.4	11	2.6	0.112
Yes	53	93.6	361	97.4	

Table 2 Characteristics of deliveries with a skilled attendant (n = 428*) (Cont.)

Characteristics	Non-skilled Attendant (n = 56*) n	(%)	Skilled Attendant (n = 372*), n	(%)	P-value of χ^2
Timing of the first antenatal check [c]					
Early	26	60.1	279	76.1	0.052
Late/none	20	39.9	90	23.9	
Enabling factors					
Wealth index					
Poorest to poorer	42	74.2	170	47.4	0.001+
Middle to richest	14	25.8	202	52.6	
Residence					
Urban	12	18.9	157	39.1	0.053
Rural	44	81.1	215	58.1	
Cost of health service					
Small problem	21	39.1	247	68.3	0.001+
Big problem	35	60.9	125	31.7	
Distance to health facility					
Small problem	42	75.9	308	84.9	0.188
Big problem	14	24.1	64	15.1	
Need factors					
Previously terminated pregnancy					
No	53	93.5	340	92.1	0.706
Yes	3	6.5	32	7.9	
Number of antenatal visits [d]					
<4	17	32.7	46	13.3	0.008+
4 or more	32	67.3	310	86.7	
Complication during pregnancy [e]					
No	44	87.6	332	89.6	0.681
Yes	6	12.4	40	10.4	

* Except for father's education, household head's occupation, timing of first antenatal visit, number of antenatal visits, and complication during pregnancy

[a] n = 424, non-skilled attendant (n= 55), skilled attendant (n= 369)

[b] n = 426, non-skilled attendant (n= 56), skilled attendant (n= 370)

[c] n = 415, non-skilled attendant (n= 46), skilled attendant (n= 369)

[d] n = 405, non-skilled attendant (n= 32), skilled attendant (n= 310)

[e] n = 422, non-skilled attendant (n= 50), skilled attendant (n= 372)

\+ Significant with $\alpha = 0.05$

Journal of Public Health and Development
Vol. 7 No. 3 September - December 2009

occupation, wealth index, perceived cost of health service, and frequency of antenatal care indicated a significant effect on the women's preference for a skilled attendant in bivariate analyses. Women with secondary or higher level of education were 3.52 times (95% CI 1.83-6.76) more likely to have a skilled attendant assist their delivery than those with lower education. Of similar effect was father's education. There was also a 3.19 (95% CI 1.56-6.51) increased chance of using a skilled attendant among women in families with middle to richest wealth index scores compared to those women in families with poorest to poorer wealth index scores. When the cost of health service was considered big problem, however, women were less likely to utilize a skilled attendant than women who perceived health service cost a small problem (OR 0.3; 95% CI 0.15-0.60). Lastly, women who had 4 or more antenatal visits were 3.16 times (95% CI 1.33-7.48) more likely to be aided by a skill attendant at their last delivery than those who had fewer visits.

By adjusting other factors, mother's educational attainment was the only significant determinant for the use of a skilled attendant. Table 3 shows the result of multivariate analysis. The adjusted odds ratio (OR) of the change in birth attendant in women with secondary or higher level of education was 2.58 (95%CI 1.35-4.93), that is 58% lower than the OR derived from simple logistic regression. The Archer-Lemeshow test showed a good fit of the final model (F-adjusted test statistic = 0.41, p-value = 0.92). Occupation of household head was excluded from the final regression because of a poor fit of the model with this variable (F-adjusted test statistic = 19856.69, p-value <0.001).

Table 3 Odds ratio for delivery with a skilled attendant by predisposing, enabling and need factors selected in the final logistic regression model, Sulawesi Utara 2002-2003 (n = 248*)

	Unadjusted OR (95% CI)		Adjusted OR (95% CI)	
Mother's education				
Primary or lower	1.00		1.00	
Secondary or higher	3.52	[1.83, 6.76]	2.54	[1.39, 4.61]
Father's education				
Primary or lower	1.00		1.00	
Secondary or higher	3.09	[1.87, 5.08]	1.48	[0.80, 2.74]

Table 3 Odds ratio for delivery with a skilled attendant by predisposing, enabling and need factors selected in the final logistic regression model, Sulawesi Utara 2002-2003 (Cont.) (n = 248*)

	Unadjusted OR (95% CI)		Adjusted OR (95% CI)	
Wealth index				
Poorest to poorer	1.00		1.00	
Middle to richest	3.19	[1.56, 6.51]	1.61	[0.56, 4.67]
Cost of health service				
Small problem	1.00		1.00	
Big problem	0.30	[0.15, 0.60]	0.60	[0.26, 1.36]
Number of antenatal visits				
< 4	1.00		1.00	
4 or more	3.06	[1.33, 7.48]	2.35	[0.77, 7.15]

DISCUSSION

The results of this study revealed that utilization of birth attendants in Sulawesi Utara can be explained by level of mother and father's education, wealth index score, perceived cost of health service, and the amount of antenatal care. From the perspective of the Andersen behavioral model, parental education would act as a predisposing factor; economic status mirrored by wealth index and the ability to afford health service cost would be enabling resources; and antenatal visits would create a need for accessing skilled delivery care [20].

After adjusting for other characteristics, however, maternal education was identified as the single, significant determinant. This determinant is one of the widely agreed predictors of skilled birth attendance in the literature. Women with higher education would be more likely to use a skilled attendant. It appeared that educated women are able to independently judge the upsides and downsides of different health care choices. By contrast, lower educational level was a barrier for women to access skilled delivery care at birth. Women with low educational attainment had almost three times lower likelihood to access and utilize a skilled attendant than those with high educational attainment. The effect of mother's education was somewhat attenuated after father's education, wealth index, cost of health service, and number of antenatal visits were controlled for, suggesting that variations in these other characteristics did explain part of the observed change in birth attendance.

Journal of Public Health and Development
Vol. 7 No. 3 September - December 2009

Father's education effect was partial on skilled birth attendance. When adjusted for other variables, the significance of this factor disappeared. The decision to seek skilled care at birth in Sulawesi Utara was apparently independent of paternal level of education.

Wealth index did not signify a notable effect on the use of a skilled attendant after variations from other variables were taken into account. This finding is in contrast to the results of previous studies.[6, 13] Community awareness of the importance of skilled birth attendance might have been high in Sulawesi Utara and decision to access maternal health care was thus independent from economic status of the families. The cost of utilizing health services could also be affordable for most of the population. Implementation of the village midwife and contract doctor programs nationwide over the last decade, particularly in remote areas where most people had limited income, might have substantially lowered the cost of accessing health care. In addition, it was evident that between the late 1990s and early 2000s, which was about the period covered by the 2002/ 2003 IDHS, the government initiated a social safety net throughout Indonesia. These national programs should have reduced the gap between the rich and the poor in accessing professional care.

Number of antenatal visits had a partial effect on utilization of skilled delivery care. This effect turned to be insignificant in the presence of socioeconomic characteristics such as parent's education, wealth index, and perceived ability to afford the cost of health service. While delivery care by a skilled attendant had been viewed essential (as indicated by high percentage of skilled attendance), antenatal care might still be regarded as optional by a number of women. Richer women would, for instance, access professional care in the antenatal period and could still afford skilled care at birth. Conversely, poorer women might prefer delaying contact with health providers until the time of delivery in order to cut cost. This would be one possible explanation for a non-significant effect of antenatal visits. Further research, however, is needed to explore the actual causes of this condition.

Availability of the new goodness-of-fit test to assess a logistic regression model fitted using survey sample data is an advantage of this study. Previously no testing procedure had been implemented in available software to serve this purpose. Unlike traditional goodness-of-fit tests, the Archer-Lemeshow test takes into account the sampling weights and design in its calculation. A detailed discussion about this test had been reported elsewhere [24]. This study also benefits from the use of the 2002/2003 IDHS data. IDHS provided recent estimates of maternal health outcomes for Indonesia. In addition, methodology of IDHS data collection is standardized and well-tested [13].

There are, however, some limitations of this study. First, IDHS data was based on women's self-report. Recall error might have occurred even though the reference period was restricted to the five years

prior to the survey. The accuracy of the reported type of birth attendants might also be uncertain especially with reports from women with low levels of education. Secondly, not all variables proposed in the Andersen behavioral model were available in IDHS data. This limited the optimal use of the model. IDHS data, for example, provide no obvious way to capture component "belief". Meanwhile, variables for "needs" were largely based on the results of the preceding studies [6, 14]. Notwithstanding such limitation, the Andersen behavioral model has been established as a robust and successful framework to explain various types of health services utilization [6, 14]. That fact prompts the use of the model in this study. Thirdly, it is important to recognize that the list of factors in this study was not meant to be exhaustive. The selection of variables was mainly driven by their availability in the IDHS data. Nevertheless, it should not detract from the value of either this study or IDHS. Demographic and health surveys remain one of the best sources of information about maternal health care [13].

One significant barrier for women to delivery care by a skilled attendant has been identified in this study. Mothers with low levels of education will be hindered when seeking professional assistance at birth. Any program for improvement should include educating women about their reproductive health and familiarizing them with maternal health services.

Future research might involve investigation in other geographical areas with similarly high percentage of deliveries by skilled attendants to assess whether the condition hold. The next step would be to compare the results with those from the provinces having low proportions of skilled birth attendance. Finally, more studies should be conducted to confirm the effects of father's education, wealth index, cost of health service, and frequency of antenatal checks. These factors have been suggested as significant determinants of preference for birth attendant in literature [6, 13, 14]. Never-theless, the findings of this study proved otherwise.

RECOMMENDATIONS

This study demonstrates the importance of maternal education as a single, significant predictor of the use of a skilled birth attendant in Sulawesi Utara. Low educational attainment was a barrier for women to accessing professional care on delivery. The health authorities and health care providers need to address this issue in order to achieve the goal of Healthy Indonesia 2010 and the international targets such as those of MDG and ICPD.

Journal of Public Health and Development
Vol. 7 No. 3 September - December 2009

REFERENCES

1. WHO. Maternal mortality in 2000 : estimates developed by WHO, UNICEF and UNFPA. Geneva: WHO; 2004.
2. United Nations. The Millennium Development Goals Report 2008. New York: United Nations; 2008.
3. Shaw D. Women's right to health and the Millennium Development Goals : promoting partnerships to improve access. Int J Gynaecol Obstet. 2006 Sep;94(3):207-15.
4. Glasier A, Gulmezoglu AM, Schmid GP, Moreno CG, Van Look PF. Sexual and reproductive health: a matter of life and death. Lancet. 2006 Nov 4 ; 368 (9547) : 1595-607.
5. BPS, ORC-Macro. Indonesia Demographic and Health Survey 2002-2003. Calverton: BPS and ORC-Macro.; 2003.
6. Thind A, Banerjee K. Home deliveries in Indonesia : who provides assistance? J Community Health. 2004 Aug;29(4):285-303.
7. Hatt L, Stanton C, Makowiecka K, Adisasmita A, Achadi E, Ronsmans C. Did the strategy of skilled attendance at birth reach the poor in Indonesia? Bull World Health Organ. 2007 Oct;85(10):774-82.
8. Liljestrand J, Pathmanathan I. Reducing maternal mortality : can we derive policy guidance from developing country experiences? J Public Health Policy. 2004 ; 25 (3-4): 299-314.
9. Font F, Alonso Gonzalez M, Nathan R, Lwilla F, Kimario J, Tanner M, et al. Maternal mortality in a rural district of southeastern Tanzania: an application of the sisterhood method. Int J Epidemiol. 2000 Feb;29(1):107-12.
10. Begum S, Aziz un N, Begum I. Analysis of maternal mortality in a tertiary care hospital to determine causes and preventable factors. J Ayub Med Coll Abbottabad. 2003 Apr-Jun;15(2):49-52.
11. Bell JA, Hussein J, Jentsch B, Scotland G, Bullough C, Graham W. Improving Skilled Attendance at Delivery: A Preliminary Report of the SAFE Strategy Development Tool. BIRTH. 2003;30(4 December 2003):227-34.
12. Carlough M, McCall M. Skilled birth attendance: what does it mean and how can it be measured? A clinical skills assessment of maternal and child health workers in Nepal. Int J Gynaecol Obstet. 2005 May;89(2):200-8.
13. Bell J, Curtis SL, Alayón S. Trends in delivery care in six countries. Calverton, Maryland : ORC Macro and International Research Partnership for Skilled Attendance for Everyone (SAFE). 2003.
14. Yanagisawa S, Oum S, Wakai S. Determinants of skilled birth attendance in rural Cambodia. Trop Med Int Health. 2006 Feb;11(2):238-51.

15. Do M. Utilization of skilled birth attendants in public and private sectors in Vietnam. J Biosoc Sci. 2009 May;41(3):289-308.
16. Stanton C, Blanc AK, Croft T, Choi Y. Skilled care at birth in the developing world: progress to date and strategies for expanding coverage. J Biosoc Sci. 2007 Jan;39(1): 109-20.
17. Anwar I, Sami M, Akhtar N, Chowdhury ME, Salma U, Rahman M, et al. Inequity in maternal health-care services: evidence from home-based skilled-birth-attendant programmes in Bangladesh. Bull World Health Organ. 2008 Apr;86(4):252-9.
18. Stephenson R, Baschieri A, Clements S, Hennink M, Madise N. Contextual influences on the use of health facilities for childbirth in Africa. Am J Public Health. 2006;96(1): 84-93.
19. Departemen Kesehatan. Indikator Indonesia Sehat 2010 dan pedoman penetapan indikator provinsi sehat dan kabupaten/kota sehat (Indicators of the Healthy Indonesia 2010 and guidelines for determining the healty province and the healthy district/municipality indicators). Jakarta: Departemen Kesehatan; 2003.
20. Andersen RM. Revisiting the behavioral model and access to medical care : does it matter? J Health Soc Behav. 1995 Mar;36(1):1-10.
21. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. Milbank Mem Fund Q Health Soc. 1973(1): 95-124.
22. Andersen RM. National health surveys and the behavioral model of health services use. Med Care. 2008 Jul;46(7):647-53.
23. Rutstein SO, Johnson K. The DHS Wealth Index. Calverton, Maryland: ORC Macro; 2004.
24. Archer KJ, Lemeshow S. Goodness-of-fit test for a logistic regression model fitted using survey sample data. The Stata Journal. 2006;6(1):97-105.