Asian Development Policy Review
ISSN(e): 2313-8343
ISSN(p): 2518-2544
DOI: 10.18488/journal.107.2014.22.39.46
Vol. 2, No. 2, 39-46

URL: www.aessweb.com

WHICH FACTORS AFFECT PROBABILITY OF WOMEN USING PRENATAL CARE? THE CASE OF BANGLADESH

Sharjil Muktafi Haque[1+]
A. K Enamul Haque[2]

[1,2]*Department of Economics, East West University, Dhaka, Dhaka, Bangladesh*

(+ Corresponding author)

ABSTRACT

This paper determines the probability of women in Bangladesh taking prenatal care based on changes in socioeconomic and health-related variables. Insight into factors affecting prenatal care usage will help policy-makers redirect health-related strategies and policies in more equitable directions. We used a total of 1,099 cross-sectional observations from Bangladesh Bureau of Statistics (2000) to estimate a logistic regression model. Our results show that education and income is positively associated with odds of women taking prenatal care while increase in age reduces odds of taking this service. We end by making several policy-relevant recommendations.

Keywords
Prenatal care
Logistic regression
Odds ratio
Household income expenditure survey
Bangladesh.

JEL Classification:
C25, I10.

Contribution/ Originality: The study contributes to the existing literature by utilizing a dataset new to the context of analyzing determinants of prenatal care in Bangladesh and confirming the impact of several variables on prenatal care usage.

1. INTRODUCTION

Millions of women in developing countries experience life threatening and other serious health problems related to pregnancy or child-birth. Complications of pregnancy and childbirth cause more deaths and disabilities than any other reproductive health problems (EC/UNFPA, 2000).One health care facility which prevents such problems is Prenatal Care. According to Akanda (2010), lack of prenatal care has been identified as a risk factor for maternal morbidity and other adverse pregnancy outcomes in many developing countries. Yucesoy (2005) identified that in such countries, adequate primary health services of maternal and child health such as prenatal care, delivery and post-natal care are considered generally unavailable to an entire population. Bangladesh, a developing country, is the eighth most populous country in the world according to

UNDP (2008). Akanda (2010) stated, 95% of births take place at home. He stated that prenatal care is one of the major reproductive health services that are offered by the health service centers to facilitate detection and prevention of pregnancy related problems. To substantiate literature on determinants of prenatal care usage in Bangladesh, we estimate probability of women taking prenatal care based on changes in relevant indicators. We are motivated from the fact that insight into impact of these factors will help health policy-makers and service providers enhance development of prenatal service in Bangladesh and improve indicators such as maternal death rates, miscarriages and birth defects. We used data from Bangladesh Bureau of Statistics (2000) conducted by Bangladesh Bureau of Statistics to estimate odds of women taking prenatal care based on changes in relevant indicators.

The study is divided into five sections. First section gives the introduction. Second section discusses literature on prenatal care and relevant estimation methods. Third section covers data classification and econometric methodology. The fourth section presents empirical findings of the study. The last section draws relevant conclusions and implications for policy.

2. REVIEW OF LITERATURE

Nisar (2003) used a multivariate logistic regression model to evaluate the combined effect of multiple factors affecting the utilization of antenatal care, adjusting for confounding variables, to assess the knowledge about antenatal care among women who received and did not receive antenatal care. The approach was to seek for the most parsimonious model, which is biologically meaningful. The model can be illustrated as follows:

$$\pi(x) = \left(\frac{e^z}{1+e^z}\right) \tag{2.1}$$

Where, $z = \beta_1 x_1 + \beta_2 x_2 + \cdots \beta_k x_k$

The Logistic was modeled as:

$$Logit\left(\pi(x)\right) = \ln\left(\frac{\pi(x)}{1-\pi(x)}\right) \tag{2.2}$$

The criterion for inclusion of factors in the multivariate analysis was to offer all variables with a p-value of <0.25, along with variables of known biological significance. All variables that met these criteria were used for building the final model. Nisar (2003) started with the variable found most significant in the univariate analysis, subsequently adding the next significant variable one after the other. Variables found statistically non-significant (>0.05), biologically not meaningful and not confounding the relationship of other independent variables with the outcome, were removed from the model.

Akanda (2010) also used a two-part model to estimate demand for prenatal care in Bangladesh using data from Bangladesh Demographic and Health Survey. The first stage was run as a logistic regression showing marginal effects on the probability of attending the first visit, and

an Ordinary Least Squares method was performed for the second stage to account for the absences to antenatal consultations once at least once visit was carried out.

The first stage of the model is represented by the following Logistic regression for mothers i and households h:

$$Yc_{ih} = \Pr(Any\ Consult_{ih} = 1) = \ln\left(\frac{p_i}{1-p_i}\right) \quad (2.4)$$

$$where, \quad \Delta p_i = \frac{1}{1+e^{-(\beta_1 E_h, \beta_2 P_{ih}, \beta_3 G_{ih})}}$$

In equation 2.4, Yc_{ih} is the dummy dependent variable which estimates the probability of a mother attend to at least one medical antenatal visit. E_h is the set of environmental variables, P_{ih} is the set of personal inform action variables, G_{ih} are explanatory variables for relevant gynecological history. Each antenatal consultation was defined in this paper as "medical consultation" when a medical doctor or professional nurse was in charge of it. Otherwise, all other visits (for instance midwives) were considered non-medical consultations.

As this dependent variable was constructed as a dummy, the meaning of its values is:

0: She did not undergo an initial consultation or if she did, she attended at least one nonmedical antenatal consultation.

1: She assisted at least to one medical antenatal consultation with a medical doctor or a professional nurse.

The second part of the model explains determinants of further consultations in function of the number of absences, given that this group of women attended at least one consultation. This dependent variable was defined as the difference between the number of consultations she should have undergone and the number of consultations she actually assisted. This implies that, the closer this variable is to zero, the closer this mother is of achieving all required antenatal consultations.

The second dependant variable is this study was modeled as shown in equation 2.5.

$$Ya_{ih} = Ec_{ih} - Pc_{ih}; Ya_{ih} > 0 \quad (2.5)$$

Where Y_a are the absences to antenatal care consultation, EC_{ih} are consultations that each woman should attend (according to her pregnancy duration) and PC_{ih} consultations she actually assisted. When antenatal care visits are more than consultations expected, a zero-value was inputted. Akanda (2010) study found out that mothers living in Chittagong division, as well as young mothers seem to have a lower probability of attending the first visit. Other significant factors which affected prenatal usage were mother's education level and number of previous children.

Finally, Shahjahan (2012) carried out a study on factors associated with use of prenatal care services in rural Bangladesh. They used logistic regression to estimate odds of women availing prenatal care based on several indicators. The study found that women who had secondary-level education were 4.5 times more likely to use this service than women who had no education.

Mothers who had only one living child were more likely to use prenatal care than those who had two or more children. Access to media also had a positive impact on odds of taking prenatal care.

3. DATA DESCRIPTION AND EMPIRICAL STRATEGY

Data used in empirical analysis in this study was taken from Bangladesh Bureau of Statistics (2000), which was conducted by Bangladesh Bureau of Statistics. The HIES is the most comprehensive dataset for household behavior and consumption patterns across Bangladesh and covers approximately 38,000 cross-sectional observations. Our study focuses on a sample of 1,099 cases based on women who has given birth at least once. Despite the fact that the dataset was obtained in 2000, we believe it still provides an accurate picture of demand of healthcare services at present. This can be substantiated by the fact that healthcare expenditure as a percentage of GDP in Bangladesh has risen only from 3.0% in 2001 to only 3.6% in 2012. Similar economies like Vietnam has increased the same indicator from 4.1% to 6.6% during the same interval (The World Bank Group, 2012). This indicates that progress on healthcare sector has not changed substantially, making our dataset a strong representative sample of Bangladesh healthcare sector at present.

We now describe the variables in our model. The dependant variable is a binary response variable which took the value "1" if a woman took prenatal care and "0" if she did not. The detailed description of the variables is shown in Table 1 below.

Table-1. Description of Variables

Variable	Description
Dependant variable	
Prenatal Care visit	Binary response variable taking 1 (Yes) or 0 (No) values for any sort of prenatal care visits as defined by Kwast (1996)
Independent Variables	
Age	Continuous variable that indicates age of women when they gave birth to their last child
Education	Continuous variable that indicates women's education in terms of no education, primary, secondary and higher than secondary level.
Income	This is an individual's cumulative annual income from jobs, rent, remittance etc. It covers all sources of income as published in HIES.
Perceived Health Status	We took a binary variable taking value "1" if an individual suffered from any illness/disability in the last 12 months, ("0" if she did not) as a proxy to perceived health status.

We now look at the statistical characteristics of the dataset (see Table 2 below) once necessary classifications are made. The mean value of the dependant variable, (Prenatal Care Visits) indicates that more than half the women in sample do not avail this facility. As might be expected, the mean value for women with primary education is higher than secondary (as well as greater than secondary). The Skewness values in excess of 2 for Education variable suggest that greatest portion of the sample fall under the "No Education" category. Similar reasoning may be applied to the set of Income variables.

Table-2. Descriptive Statistics

	Mean	Standard Deviation	Variance	Skewness	Kurtosis
Prenatal Care	0.3724316	0.4834809	0.2337538	0.5277391	1.278509
Age (Reference: 0)	28.04567	7.548639	56.98195	0.5634335	2.697175
Education [1] (Reference: No Education)					
Primary	0.1432261	0.3503238	0.1227268	2.036943	5.149136
Secondary	0.0859357	.2802855	.0785599	2.954763	9.730627
Greater than Secondary	0.0986147	0.2981615	0.0889003	2.69256	8.24988
Income [2] (Reference: Lowest percentile)					
Middle percentile	0.1763636	0.3813026	0.1453917	1.698302	3.884231
Highest percentile	0.0545455	0.2271941	0.0516172	3.92314	16.39103
Perceived Health Status	0.1564269	0.3632643	.131961	1.891612	4.578196

We now outline the specification of our estimation model. Following the works of Shahjahan (2012), Nisar (2003) and Akanda (2010), we used logistic regression to estimate the probability of a pregnant woman availing prenatal care based on changes in specific socioeconomic variables. The model specification is shown below in equation 3.1.

$$\hat{Y}_{p_{ih}} = \Pr(Any\ Prenatal\ Visit_{ih}) = \ln\left(\frac{p_i}{1-p_i}\right) \tag{3.1}$$

$$where, \qquad \Delta p_i = \frac{1}{1+e^{-(\beta_1 A_h, \beta_2 E_{ih}, \beta_3 I_{ih}, \beta_4 H_{ih})}} \tag{3.2}$$

In equation 3.1, $\hat{Y}_{p_{ih}}$ is the binary dependant variable which estimates the average probability of a mother to attend at least once antenatal care visit during her most recent pregnancy. The determinants of p_i are shown in equation 3.2. A_h is the variable for age of a woman when she gave birth to her last child. E_{ih} is a vector of 4 dummy variables for different levels of education with "no education" as reference (the other three are primary, secondary and higher than secondary education level). I_{ih} is a set of 3 dummy variables for different percentiles of income with "lowest percentile" as reference group (the other two are middle percentile and highest percentile). H_{ih} is another binary variable which covers information regarding whether a woman has suffered from any chronic illness or disability in the last 12 months as defined in Table I. We used this variable as a proxy for "Perceived Health Status".

Odds Ratio (OR) as outlined by Gujarati (2004) and Greene (2003) was computed to identify the odds that a woman will take prenatal care based on changes in explanatory variables. Finally, we used White (1980) transformation to account for cross-sectional heteroscedasticity.

[1] We followed education classification according to that of Chakraborty (2003). who found that these classifications showed greatest effect on probability of availing health care facilities.

[2] Income was reclassified according to percentiles as shown in Table IV in Appendix.

4. EMPIRICAL RESULTS

In this section we present the findings of the logistic regression analysis. As mentioned in the previous section, in addition to regression coefficients, the OR is presented to determine odds of women taking prenatal care.

Table-3. Results of Logistic Regression

Dependant Variable: Prenatal Care; Number of Observations = 1,099
Log Pseudolikelihood = -129.21653; Pseudo R^2 = 17%; Wald Chi^2=56.32; Prob> Chi^2 = 0.0000

	Odds Ratio	Co-efficient	Std. Err.	Z	P>Z
Education (Reference: No Education)					
Primary	5.399563	1.686318	2.762092	3.51	0.001*
Secondary	4.714294	1.550599	3.743177	1.92	0.051***
> Secondary	18.0181	2.891377	12.34089	3.93	0.000*
Age	0.9515027	-0.0497128	0.0232066	-2.11	0.042**
Income (Reference: Lowest Percentile)					
Middle Percentile	1.682592	.5203357	0.7848906	1.12	0.265
Highest Percentile	3.121789	1.138406	1.862455	1.91	0.056***
Perceived Health	0.5988228	-0.5127895	.244622	-1.26	0.209

Note: * Significant at 1% confidence interval; ** Significant at 5% confidence interval' ***Significant at 10% confidence interval.

Table III above presents the estimates of the logistic regression, as well as the associated OR. Both variables, Education and Age have significant effects on probability of using prenatal care. We found that women who have primary level education are 5.4 times more likely to take the service than women who have no education. Women, who have greater than secondary-level education, have 18 times greater odds of taking this service compared to women who have no education. This confirms the expectation that education, at least to a certain minimum level, is essential for women to be aware of the benefits of a prenatal care.

We observed that increase in age (when women gave birth to her last child) lowers the odds of taking prenatal care. This contrasts with the intuitive thesis that with age, or maturity, women become more aware of benefits of prenatal care. However, the relationship is not uncommon: negative relationship between Age and Prenatal Care has also been found in previous study like the one carried out by Alexandre (2005) in rural Haiti. We can infer that women become more experienced with age and thus feel they require less consultations than younger women who have little experience in child birth related issues.

The income variable, as expected, increases the odds of taking prenatal care. As can be seen from Table III, women who are in the highest percentile of income groups are 3.12 times more likely to take prenatal care than those in the lowest percentile.

Finally, we found that perceived health status is not statistically significant. We thus conclude, that Income, Education and Age are the main determinants of prenatal health-care visits for women in Bangladesh.

It must be noted that the Bangladesh Bureau of Statistics (2000) dataset does not give information such as husband's education, access to healthcare facilities and frequency of prenatal consultations. All of these factors were commonly used in previous literature to further explain behavior towards prenatal care. Another limitation of the HIES dataset is that it provides information for only one specific time-period. We believe to better understand how the factors affect demand for prenatal care, the behavior of the same variables over a period of time (for the same individuals) can be studied. However, such panel data is not commonly available in Bangladesh at p resent.

5. CONCLUSIONS AND IMPLICATIONS FOR POLICY

Using data from Bangladesh Bureau of Statistics (2000) we estimated the probability of women in Bangladesh taking prenatal care based on changes in several relevant indicators. We used logistic regression analysis to identify the odds that women will take prenatal care. Our results show that Education, Age and Income were significantly associated with prenatal care visits. Based on our findings, we make the following recommendations for policy-makers:

i. **Greater Resource Allocation in Education:** Given the impact of education on availing prenatal care, policy-makers need to allocate greater resources on education for women to ensure that they become aware of the benefits of proper healthcare consultations during pregnancy.

ii. **Emphasize prenatal care to older women:** Since our findings suggest that younger women are more likely to take this service, we recommend emphasizing the significance of prenatal care to older women and highlight the risks associated with complications during pregnancy to such age-groups.

iii. **Targeting women of lower-income groups:** Our final suggestion is to specifically target women of lowest income groups as they are least likely to take prenatal care and promote the benefits of this facility.

We believe future research in healthcare in Bangladesh can focus on impact of relevant variables not covered in this study (proximity to healthcare facilities, husband's education etc) on probability of prenatal care consultations.

REFERENCES

Akanda, A.S., 2010. Demand for antenatal care in Bangladesh: An application of two-part model. South Asian Journal of Population and Health, 3(1): 29-41.

Alexandre, P.S.-J., 2005. Prenatal care utilization in rural areas and urban areas of haiti. Pan America Journal of Public Health, 18(2): 84-92.

Bangladesh Bureau of Statistics, 2000. Report of household income expenditure survey (HIES). Planning Division, Government of the People's Republic of Bangladesh.

Chakraborty, M.A., 2003. Determinants of the use of maternal health services in rural Bangladesh. Health Promotion International, 18(4): 327-337.

EC/UNFPA, 2000. Making pregnancy and childbirth safer (Fact Sheet). EC UNFPA Initiative for reproductive health in Asia in cooperation with the German foundation for World Population.

Greene, W., 2003. Econometric analysis. New Jersey: Pearson Education.

Gujarati, D.N., 2004. Basic econometrics. New York City: McGraw-Hill-Education.

Kwast, B., 1996. Reduction of maternal and perinatal mortality in rural and pen-urban setting: What works. Eur J Obstet Gynecol Reprod Biol, 69(47): 53.

Nisar, E.W.N., 2003. Factors affecting utilization of antenatal care among reproductive agre group women in an urban squatter settlement of Karachi. Journal of Pakistan Medical Association, 53(2): 47-53.

Shahjahan, H.A.M., 2012. Factors associated with use of antenatal care services in a rural area of Bangladesh. South East Asia Journal Of Public Health, 2(2): 61-66.

The World Bank Group, 2012. Healthcare expenditure, total (% of GDP). Available from www.worldbank.org: http://data.worldbank.org/indicator/SH.XPD.TOTL.ZS [Accessed February 2014].

UNDP, 2008. UNDP human development index statistical update. UNDP-Bangladesh.

White, H., 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica, 48(4): 817-838.

Yucesoy, O.B., 2005. Maternal and perinatal outcome in pregnancies complicated with hypertensive disorder of pregnancy: A seven year experience of a tertiary care center. Archives of Gynecology and Obstetrics, 273(1): 43-49.

Appendix-1. Income Classification according to Percentiles

Percentile	Income-Range (BDT)	Coded Value
75th	0-15,350	1
90th	15350<>30,710	2
Greater than 90th	30,710<	3

Percentiles reported in Appendix-1 are the default percentile groups reported by statistical software Stata (Version 11) for the sample used in this analysis.