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Original Paper

Why Do Women Delay in Seeking Prenatal Care? A Discrete-Time Survival Analysis

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Abstract

This paper evaluates the effect of access to the Ghana national health insurance on the timing of the first prenatal care visit for pregnant women after controlling for other factors. Due to the voluntary nature of the national health insurance program, insurance status is likely endogenous, this paper therefore uses the Multilevel Multiprocess (MLMP) model and the Mixed Proportional Hazard (MPH) model estimation techniques, which controls for endogeneity in survival data analysis. Results from the estimation shows that access to insurance reduces the delays in receiving prenatal care, and increases the probability of seeking prenatal care.

Keywords

social health insurance, prenatal care, survival analysis

JEL Classification Code: I12, O12, I150

1. Introduction

The lack of prenatal healthcare has been identified as an important determinant of maternal mortality in developing countries. About 75% of maternal deaths in 2017 occurred from complications during pregnancy; 94% of these maternal deaths occurred in developing countries and Sub-Saharan Africa alone accounted for roughly two-thirds (WHO, 2019). The maternal mortality ratio in developing countries in 2017 was 467 per 100,000 live births versus 11 per 100,000 live births in developed countries (WHO, 2019). In Ghana, the maternal mortality ratio in 2017 was estimated at 308 maternal deaths per 100,000 live births (The World Bank, 2019). This paper evaluates the effect of access to social health insurance on the timing of first prenatal care visit by pregnant women using a discrete time survival analysis and utilizing data from two rounds of the Ghana Living Standards Survey (GLSS), GLSS V (2005/2006) and GLSS VI (2012/2013).

One of the eight Millennium Development Goals (MDG 5) was to achieve a reduction in the maternal mortality ratio (MMR) by three quarters between 1990 and 2015, which meant a maternal mortality ratio of 190 maternal deaths per 100,000 live births in Ghana in 2015. Prenatal care during early stages of pregnancy can provide improved health of mothers and babies and cost reductions in the case of early detection of some pregnancy related complications which can also reduce maternal mortality (Conway et al., 2006).

The major goals of prenatal care include promoting a healthy pregnancy for the mother and fetus, as well as educating the mother about pregnancy, birth and infant care. To help accomplish these goals, the World Health Organization (WHO) recommends a minimum of eight prenatal care visits, but due to factors such as income, cost, availability of healthcare facilities, and lack of human resources, these recommendations are not being met in most developing countries (Jewell, 2009; Gertler et al., 1987). There is no set time for the first prenatal visit but some studies have shown adverse maternal and infant outcomes associated with late prenatal care visits during pregnancy (Quick et al., 1981). Understanding the main drivers motivating the decision to delay in seeking care is an important area of study which can help policy makers implement policies aimed at curbing maternal deaths and decreasing the delays in seeking prenatal care. The decision to delay seeking prenatal care can be attributed to a number of factors such as the cost of health care, access to health insurance, income, marital status, religious reasons, among others (Kenney et al., 1995; and Pagnini et al., 2000).

An important social intervention that was instituted in Ghana to mitigate the cost of health care was the establishment of the National Health Insurance Scheme (NHIS), aimed at providing affordable health care to the people of Ghana. This paper seeks to answer two questions: (1) How does the introduction of social health insurance affect the timing of a woman's first prenatal care visit? and (2) Does health insurance increase the probability of receiving prenatal care? To answer these questions, we use two rounds of household survey data sets; the first taking place shortly after the national social health insurance program was implemented and the second, a number of years after the national insurance roll out. The Ghana National Health Insurance Scheme (NHIS) was instituted in 2003 to provide equitable and universal access to health care services for all Ghanaians. Individuals in the informal sector are allowed to voluntarily enroll in the health insurance program. Voluntary enrollments in insurance programs are mostly seen as being problematic as people with higher probability of using the program such as the older and sicker usually enroll in greater numbers than the young and healthy individuals. Due to the voluntary nature of the Ghana national health insurance program, there is a potential for pregnant women who would have used prenatal care in absence of the program to self select into the insurance program which can lead to unobserved heterogeneity. As a result insurance status is likely endogenous. To address the endogeneity problem in the insurance status, this paper uses the Multilevel

Multiprocess (MLMP) model and the Mixed Proportional Hazard (MPH) model which addresses endogeneity (unobserved heterogeneity) in survival analysis and duration models. The multilevel multiprocess model is used to analyze the impact of social health insurance on the gestational age at which women receive their first prenatal visit while the mixed proportional hazard model addresses the impact of social health insurance on the probability of seeking prenatal care.

In a developing country context, there have been several studies regarding prenatal care and health insurance. Simkhada et al. (2008) studied the factors affecting the utilization of prenatal care in developing countries and found maternal education, marital status, cost of care, household income, and having a history of obstetric complications as the most significant factors affecting prenatal care. In Ghana, Abrokwah et al. (2014), studied how Ghana's National Health Insurance (NHIS) program affects prenatal care usage and out-of-pocket expenditures using a two-part model and found that access to the national health insurance increases the number of prenatal care visits, and lowers out-of-pocket expenditures. Smith et al. (2006), studied the Community-Based Health Insurance (CBHI) and access to maternal health services for Ghana, Mali, and Senegal and found that CBHI increases maternal health care access.

There is scant economic literature in the area of applying survival analysis and duration models in studying health care seeking behavior—for example how people's behavior changes over time when they are sick, injured or become pregnant, with and without the presence of social intervention programs. There are a few studies that have researched different aspects of timing of prenatal care usage including Essex et al., (1992), Kenney et al., (1995), Currie et al., (1996) and Rowe et al., (2003). Quick et al., (1981), studied the effect of delayed prenatal care on maternal and infant health outcomes and found that women who delay seeking prenatal care have a higher risk of neonatal mortality, higher infant mortality and babies with lower birthweights. Alderliesten et al., (2007) is the only paper to the best of our knowledge that studies delays in prenatal care using survival analysis. They studied the difference in timing of the first prenatal visit between ethnic groups in the Netherlands and the effect of some risk factors on this timing using the Kaplan Meier survival curve and Cox Proportional Hazard Model. They found that in comparison to caucasian Dutch women, there is delay by all ethnic groups in the timing of their first prenatal visit and these differences were explained by risk factors such as poor language proficiency in Dutch, lower maternal education and teenage pregnancies in women born in non-Dutch-speaking, non-Western countries.

To the best of our knowledge, this is the first paper to evaluate the impact of social health insurance on the timing of the first prenatal visit by pregnant women using a survival model which controls for endogeneity and unobserved heterogeneity. The literature on developing countries focuses mostly on prenatal care usage and insurance but not the timing of first prenatal care. Delay in starting prenatal care can lead to higher infant mortality and babies with lower birthweights (Quick et al., 1981; and Kenney et al., 1995). Since most developing countries are plagued with a high incidence of maternal and infant mortality, this paper identifies insurance as a factor that reduces delays in seeking prenatal care which can help policy makers in their fight against maternal and infant mortality

2. The Ghana National Health Insurance Scheme

The Ghana National Health Insurance Scheme (NHIS) is a social health insurance program established by the government of Ghana in 2003 to provide affordable healthcare, ensure equity in health coverage and also improve access to health care services for all Ghanaians. The NHIS replaced the "cash and carry (Note 1)" system where user fees were charged for health services.

Informal sector workers who make up the majority of the population could enroll voluntarily into the NHIS. Formal sector workers however, are mandated to enroll and receive a payroll deduction of 2.5 percent of income, unless they are able to prove that they have private health insurance. Informal sector workers who enroll in the NHIS pay a flat premium payment of 7.2 GhC ($1.82) for the poor and 48GhC ($12.11) for the rich. There is also the payment of an annual registration fee, which ranges from 7 to 50GhC ($1.77 to $12.61). Groups such as pensioners, people above the age of 70, children under age 18, the "core poor (Note 2)" and pregnant women (as of 2008) are exempted from paying premiums.

Statistics by the National Health Insurance Authority (NHIA) on NHIS registration show that enrolment has increased since operations began in late 2005. Figure 1 from the NHIA 2011 report shows that enrollment in the NHIS increased from 6% in 2005 to 71% in 2011. Registration in the free maternal care program under the NHIS has also increased since it's introduction in late 2008. There has been an increase in enrolment from 380, 000 in 2009 to 774,000 in 2013 as shown in Figure 2.

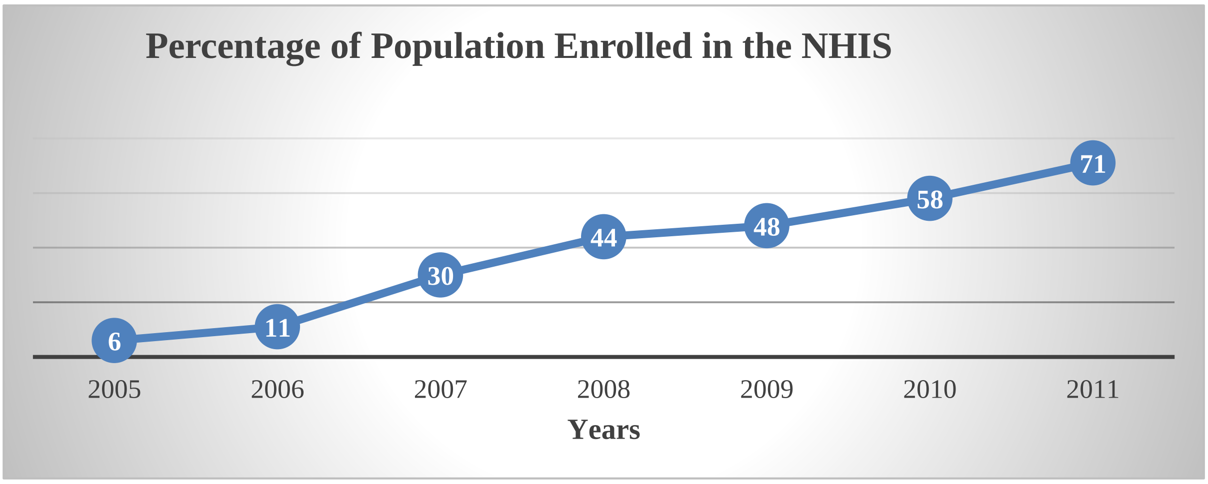

Figure 1. Graph of the Percentage of Population Enrolled in the NHIS

Source: Ghana National Health Insurance Authority (NHIA)

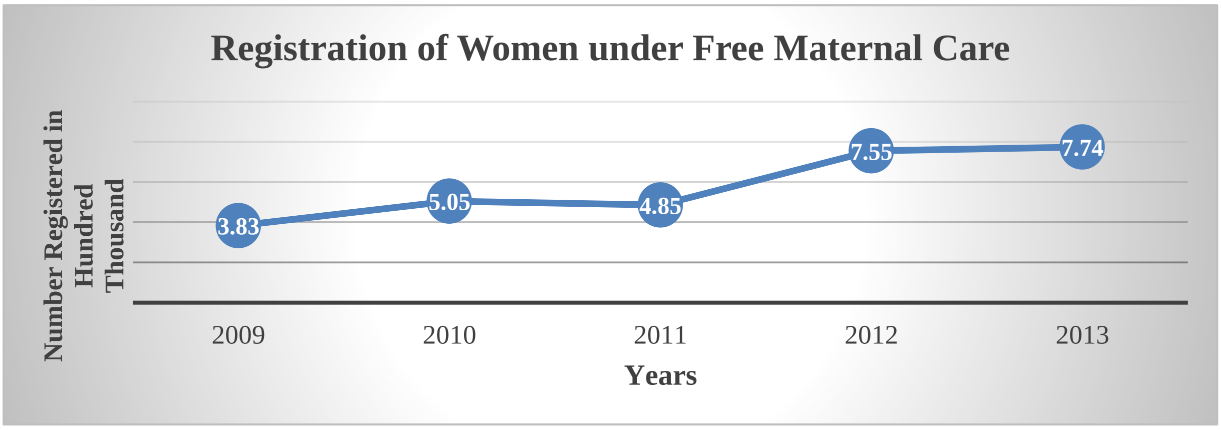

Figure 2. Graph of the Number of Women Registered under Free Maternal Care

Source: Ghana National Health Insurance Authority (NHIA)

2.1 Data and Descriptive Statistics

This study uses data from the 2005/06 and 2012/13 Ghana Living Standards Survey (GLSS), conducted in September 2005 to September 2006, and October 2012 to October 2013 respectively. At the time of the 2005/06 survey (GLSS V), the national health insurance roll out had been implemented in only certain districts in the country and by the 2012/2013 survey (GLSS VI) every district/community had access to social health insurance. The 2005 GLSS sampled 8,867 households, while the 2012 GLSS sampled 18,000 households. The subsample used for this study includes only women of child-bearing age, ages 15 through 49 who were pregnant within one year of the survey date. This reduces the sample to 978 observations for the 2005, and 1708 observations for 2012.

There are differences in health insurance coverage for pregnant women between the 2005 and the 2012. At the time of the 2005 survey, not all women had access to the Ghana national health insurance and pregnant women did not receive free prenatal care. Pregnant women had to pay premiums before using the NHIS. By the 2012, almost all women had access to insurance and pregnant women received free prenatal care. Due to these differences in insurance coverage between the two surveys coupled with the fact that the 2005 is the first survey after the introduction of the national health insurance, estimations are done initially using the 2005. The 2012 is later added in a pooled setting to analyze the effects over time.

Table 1. Descriptive Statistics by Survey Period (Bivariate Comparison)

	2005/2006 GLSS		2012/2013 GLSS		Significance
Variables	Mean	SD	Mean	SD	
Insurance (=1 If individual had health insurance)	0.107	(0.309)	0.668	(0.471)	***
Gestational Age at first Prenatal Visit (weeks)	15.066	(9.350)	12.750	(9.030)	***
Prenatal Care (=1 individual had received prenatal care)	0.925	(0.263)	0.941	(0.235)	
Demographics					
Age	28.866	(7.051)	28.845	(6.830)	
Urban (1=Urban, 0 = Rural)	0.283	(0.451)	0.331	(0.471)	**
Distance to health facility	97.077	(112.444)	58.434	(63.422)	***
Occupation					
Agriculture	0.456	(0.498)	0.432	(0.496)	
Trading	0.164	(0.370)	0.222	(0.416)	***
Professional	0.011	(0.105)	0.042	(0.201)	***
Education					
No education	0.755	(0.431)	0.367	(0.482)	***
Primary education	0.238	(0.426)	0.579	(0.494)	***
Secondary or Higher	0.007	(0.084)	0.054	(0.225)	***
Income quintiles					
1st Income quintile	0.560	(0.867)	0.482	(0.734)	**
2nd Income quintile	0.284	(0.605)	0.301	(0.644)	***
3rd Income quintile	0.094	(0.241)	0.123	(0.255)	
4th Income quintile	0.062	(0.183)	0.094	(0.163)	
5th Income quintile	0.014	(0.118)	0.034	(0.182)	***
Married (1=Married, 0 = Otherwise)	0.725	(0.447)	0.729	(0.445)	
Previous pregnancy outcome (1=stillbirth, 0=livebirth)	0.217	(0.412)	0.183	(0.387)	**
Number of children living	3.118	(2.031)	3.044	(2.029)	
Number of observations	978		1708		

NB: *, ** and *** indicate statistical significance at 10, 5 and 1% respectively

For this analysis, the time variable of interest is the gestational age at the first prenatal care visit. Patients are right censored if they didn't receive prenatal care. Table 1 presents the descriptive statistics for the variables used in the analysis for both 2005 and 2012. There is no significant difference in the average number of women who received prenatal care in both samples. On average, about 90% of women received prenatal care in both samples. An average of about 10% of the women in the sample in the 2005 had insurance as opposed to 67% in the 2012.

The average gestational age at which women receive their first prenatal care is 15 weeks for women in the 2005 and 12 weeks for 2012.

Figure 3 shows the average time at which insured and uninsured women receive their first prenatal care for both surveys. Insured women in the 2005 on average receive their first prenatal care at 13 weeks of pregnancy compared to about 15.3 weeks for uninsured women. The average timing of first visit is lower for both the insured and uninsured in the 2012, however, the insured receive care about 3 weeks earlier than the uninsured. Comparing across surveys, the difference in timing is smaller between the insured relative to the uninsured.

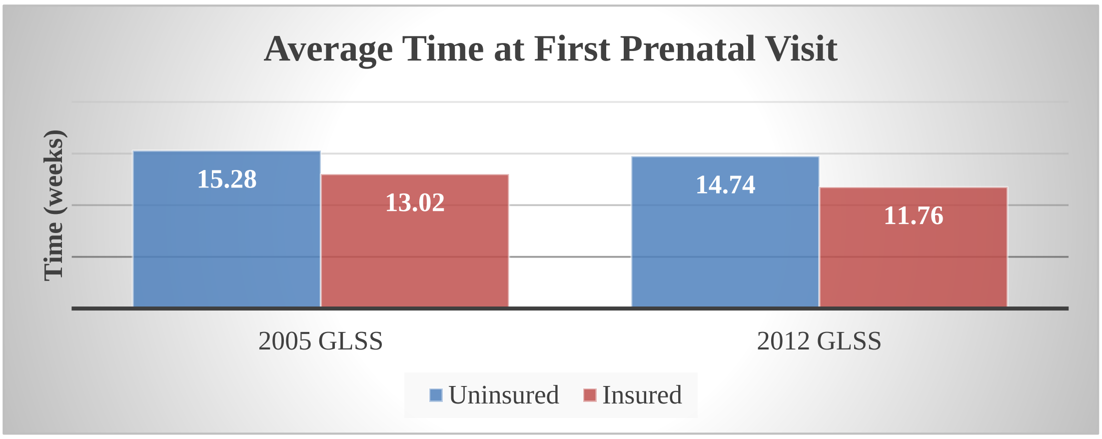

Figure 3. Graph of the Average Gestational Age at First Visit for Insured and Uninsured Women in both 2005 GLSS and 2012 GLSS (Note 3)

2.2 Nelson-Aalen Estimator Graphs

The Nelson-Aalen estimator is mostly applied to survival data analysis to estimate the cumulative number of expected events over time. This technique is used to estimate the cumulative hazard rate (H(t)) function from censored survival data as an increasing right step function with increments at the observed failure times. H(t) is the sum of the hazards at all event times up to t and it also records the number of times we would expect to observe the hazard over a given period if it were repeatable. The Nelson-Aalen curve shows the relationship between the cumulative hazard rate and time. The hazard rate in this paper is the cumulative probability of receiving prenatal care or the proportion of women who receive prenatal care over time. The time variable is the gestational age at first prenatal visit which is measured in weeks.

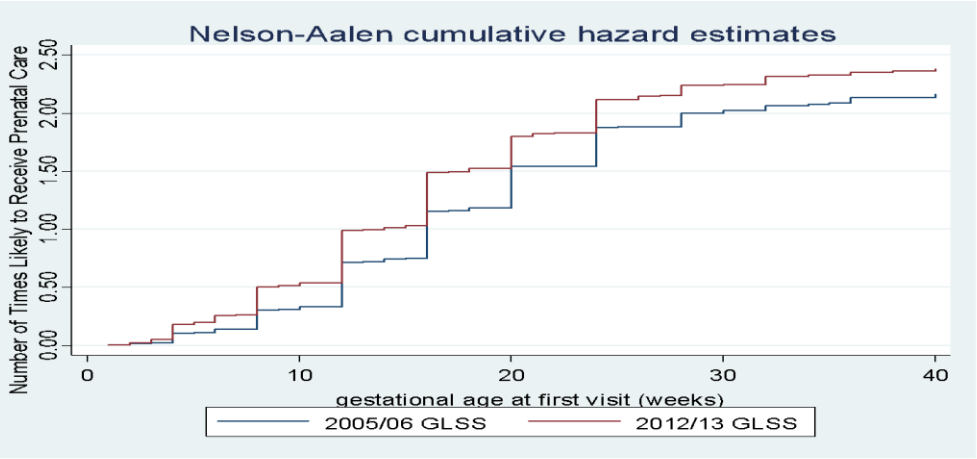

Figure 4. Nelson-Aalen Graph for Changes in the Number of times a Woman Is Likely to Receive Prenatal Care over Time for both 2005/2006-GLSS V and 2012/2013-GLSS VI

Figure 4 shows the Nelson-Aalen graph for the sample of women for both the 2005 and 2012 surveys. The blue line shows data from the 2005 and the red line shows data from the 2012. We can see from Figure 4 that pregnant women in year 2012 had a higher probability of receiving prenatal care at each point in their pregnancy than pregnant women in the 2005. For example, we can see that at 10 weeks, a woman in 2012 is 0.6 times more likely to receive prenatal care compared to 0.3 in 2005.

Figures 5 and 6 show the Nelson-Aalen graphs for the insured and uninsured women in 2005 and 2012 respectively. For both the 2005 and the 2012, insured women are more likely to receive prenatal care relative to the uninsured women.

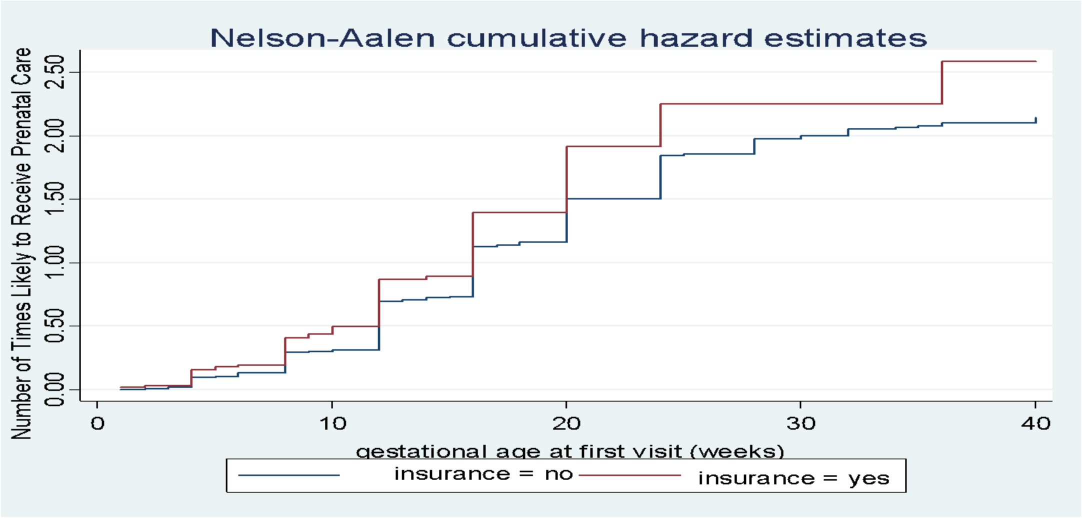

Figure 5. Nelson-Aalen Curve for Changes in the Number of Times a Woman Is Likely to Receive Prenatal Care Over Time for Insured and Uninsured Women (2005/2006-GLSS V)

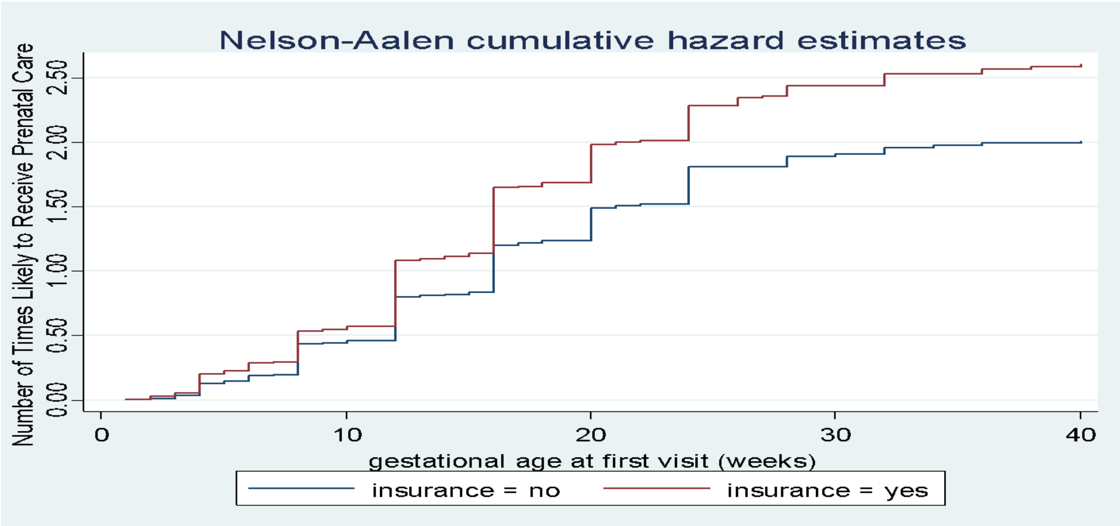

Figure 6. Nelson-Aalen for Changes in the Number of Times a Woman Is Likely to Receive Prenatal Care over Time for Insured and Uninsured Women (2012/2013-GLSS VI)

3. Methodology

A major problem of studying the effect of the social insurance in Ghana on the timing of the first prenatal visit is the issue of endogeneity as pregnant women could self select into the insurance program because of the voluntary enrollment associated with part of the NHIS program. To deal with the issue of endogeneity and unobserved heterogeneity in insurance status, this paper uses the multilevel multiprocess model and the mixed proportional hazard model which deals with endogeneity in survival analysis. The multilevel multiprocess model is used to answer the question: how does the introduction of social health insurance impact the timing of a woman's first prenatal care visit? While the mixed proportional hazard model is used to analyze the impact of insurance on the probability of receiving prenatal care.

3.1 Multilevel Multiprocess Model (MLMP)

The multilevel multiprocess models (MLMP) are used to control for selection biases which arise from unobserved personality traits. The MLMP model consists of multilevel proportional hazards equations which include correlated heterogeneity components, with normally distributed random effects and are used to control for endogeneity and selection effects. Including jointly normally distributed random effects allows one to adjust estimates for the correlation of the total underlying residuals, and it allows one to estimate the covariance matrix of residuals and, hence, the selection effects (Lillard, 1993).

In controlling for endogeneity in survival analysis, the MLMP models estimate lognormal survival models jointly with probit models. If the hazard of the event under study is affected by an endogenous dummy, the hazard in question and the occurrence of the endogenous dummy are modeled jointly:

$$lnh_{ij} = \beta^{(1)}X_{ij} + u^{(1)}$$

$$y*_{ij} = \beta^{(2)}X_{ij} + u^{(2)}$$

Where lnh is the log of the hazard, $y*$ is the endogenous dummy variable, i indexes individuals and j indexes the recurrent observations. Vector X is a vector of explanatory variables in the equations. The lognormal model is further reformulated as an accelerated failure-time (AFT) model which measures the direct effect of the explanatory variables on the survival time. The log failure times (τ) model can be represented as:

$$ln\tau^{(1)} = \beta^{(1)}X_{ij} + u_i^{(1)} + v_{ij}^{(1)}$$
$$ln\tau^{(2)} = \beta^{(2)}X_{ij} + u_i^{(2)} + v_{ij}^{(2)}$$

These equations are seemingly unrelated because the error terms can be correlated. The AFT model assumes that the distribution of the duration of an individual with covariate vector X and the transformed duration of $e^{\beta X}$ are the same since the covariates affect the duration proportionally (Bijwaard, 2008). When the coefficient β is greater than zero, the covariate accelerates the duration, and decelerates the duration when the coefficient is smaller than zero.

3.2 Mixed Proportional Hazard (MPH) Model

The Mixed proportional hazard (MPH) model estimates discrete time proportional hazards models using maximum likelihood estimation by specifying the hazard rate as the product of a regression function that captures the effect of observed explanatory variables, a base-line hazard that captures variation in the hazard over the spell, and a random variable that accounts for the unobserved heterogeneity. In the mixed proportional hazard model, the hazard is a function of a regressor X, unobserved heterogeneity u, and a function of time $\lambda(t)$,

$$\theta(t\,|\,X,u) = ue^{X\beta_o}\lambda(t)$$

The function λ(t) is often referred to as the baseline hazard and $u|X$ has a gamma distribution. Covariates may include fixed or time-varying regressor variables and variables summarizing the duration dependence of the hazard rate. In estimating the model, the data is first re-organized so that, for each person, there are as many data rows as there are time intervals at risk of the event occurring for each person. Mandatory variables such as unique identifier variable for each subject, a spell week identifier variable for each subject and a binary dependent variable (If subject i's survival time is censored, the binary dependent variable is equal to 0 for all of i's spell weeks; if subject i's survival time is not censored, the binary dependent variable is equal to 0 for all but the last of i's spell weeks (week 1, ..., Ti-1) and equal to 1 for the last week (week Ti)) are created. The data set is then expanded so that there is one data row per person per week with the probability of receiving prenatal care. The results from the MPH model incorporates a Gamma distributed random variable to describe unobserved heterogeneity between individuals. The proportional hazard model measures the effect of the explanatory variable on the hazard rate, which in the case of this study is the probability of receiving prenatal care.

4. Empirical Results

4.1 Multilevel Multiprocess Model Estimation Results

Results from estimation of the 2005 is shown in table 2 below on the effect of social health insurance on the gestational age at first prenatal care visit, controlling for some demographic characteristics using the multilevel multiprocess model to control for endogeneity. The MLMP models measure the direct effect of the explanatory variables on the survival time. If the time ratio is greater than 1, then the gestational age increases as the value of the explanatory variable increases. However, if the time ratio is less than 1, then the gestational age decreases as the value of the explanatory variable increases.

Results of two models are presented in Table 2; model 1 includes the basic characteristics of the woman and household and model 2 adds regional dummy control variables. For the main variable of interest, insurance status, the results from Table 2 shows that the impact of insurance on the gestational age at first visit is negative and statistically significant at the 5% level for both models. The time ratio shows that having insurance decreases the gestational age at which women receive their first prenatal care compared to the uninsured. The value of the time ratio suggests that switching from being uninsured to being insured decreases the time a pregnant woman waits to receive her first prenatal care by 53%. This result is expected because health insurance lowers health care costs for pregnant women and enables them to reduce the delays in receiving their first prenatal care.

In terms of the other factors affecting the timing of prenatal care, a few results are worth pointing out. Both models show that married women receive prenatal care earlier than unmarried women. Women who travel a longer distance before getting to a health facility delay their first prenatal visits. Most women in the informal sector are traders who are mostly in the lower income quintile. The result shows that women who are in trade delay seeking prenatal care.

Table 3 shows results for pooled data using the MLMP model. The results are consistent with the previous results. More specifically, insurance decreases the gestational age at first prenatal visit by 47%. Women who have experienced still-births in previous pregnancies receive care earlier than women who haven't. The dummy variable for the survey year is not significant.

4.2 Mixed Proportional Hazard Model Estimation Results

The proportional hazard model measures the effect of the explanatory variable on the hazard rate, which in the case of this study is the probability of receiving prenatal care. If the hazard ratio is greater than 1, then the probability of receiving prenatal care increases as the value of the explanatory variable increases. If the hazard ratio is less than 1, then the probability of receiving prenatal care decreases as the value of the explanatory variable increases.

The results from Table 4 shows that having insurance increases the probability of receiving prenatal care compared to the uninsured in the 2005. As insurance becomes more affordable and accessible to pregnant women, even those who would have otherwise not received prenatal care are now more likely to receive care. Insurance is still positive and statistically significant in the pooled data as shown in Table 5. The statistically significant coefficient for the duration variable in both Tables 4 and 5 suggests that, the further along a woman gets into her pregnancy, the more likely she is to receive prenatal care. Women with primary school education and lower are less likely to receive prenatal care compared to women with higher education. Less educated women may be less likely to realize the benefits of using prenatal care services as compared to educated women (Matsumura & Gubhaju, 2001). Being married also increases the probability of receiving prenatal care.

Table 2. Multilevel Multiprocess Model Regression on the Effect of Social Health Insurance on Timing of First Prenatal Visit Using the 2005/06-GLSS V

	Model 1		Model 2	
Gestational Age at first Prenatal Visit	Coefficient	Time Ratio	Coefficient	Time Ratio
Insurance (=1 If individual had health insurance)	-0.752**	0.471	-0.649**	0.523
	(0.296)		(0.312)	
Demographics				
Age	0.001	1.001	0.0005	1.0005
	(0.005)		(0.006)	
Urban (1=Urban, 0=Rural)	0.049	1.050	0.009	1.009
	(0.063)		(0.061)	
Distance to health facility	0.001**	1.001	0.0003	1.0003
	(0.0002)		(0.0002)	
Married (1=Married, 0 = Otherwise)	-0.112**	0.894	-0.200***	0.818
	(0.055)		(0.060)	
Occupation				
Agriculture	0.058	1.060	0.083	1.087
	(0.057)		(0.055)	
Trading	-0.150*	0.860	-0.103	0.902
	(0.079)		(0.083)	
Education				
No education	0.474	1.606	0.079	1.082
	(0.291)		(0.609)	
Primary education	0.396	1.486	0.143	1.154
	(0.288)		(0.595)	
Income quintiles				
1st Income quintile	0.032	1.032	0.042	1.043
	(0.074)		(0.077)	

2nd Income quintile	0.140	1.150	0.158*	1.171
	(0.083)		(0.085)	
3rd Income quintile	0.013	1.013	-0.012	0.988
	(0.102)		(0.098)	
4th Income quintile	0.204	1.226	0.135	1.145
	(0.132)		(0.155)	
Previous pregnancy outcome (1=stillbirth, 0=livebirth)	-0.067	0.935	-0.089	0.915
	(0.058)		(0.057)	
Number of children living	0.009	1.009	0.019	1.019
	(0.019)		(0.020)	
Regional Dummies	No		Yes	
Constant	1.997***	7.366	2.374***	10.74
	0.336		0.634	
Number of observations	978		978	

*, ** and *** indicate statistical significance at 10, 5 and 1% respectively

Note. The MLMP models measure the effect of the explanatory variables on the gestational age at first visit.

Table 3. Multilevel Multiprocess Model Regression on the Effect of Social Health Insurance on Timing of First Prenatal Visit Using the 2005 and 2012

	Model 1		Model 2	
Gestational Age at first Prenatal Visit	Coefficient	Time Ratio	Coefficient	Time Ratio
Insurance (=1 If individual had health insurance)	-0.626***	0.535	-0.602***	0.548
	(0.226)		(0.213)	
Demographics				
Age	-0.002	0.998	-0.002	0.998
	(0.004)		(0.003)	
Urban (1=Urban, 0=Rural)	0.034	1.035	0.048	1.049
	(0.037)		(0.039)	
Distance to health facility	0.0002	1.0002	0.0001	1.0001
	(0.0002)		(0.0002)	
Married (1=Married, 0=Otherwise)	-0.114***	0.892	-0.129***	0.879
	(0.037)		(0.038)	

Occupation				
Agriculture	0.038	1.039	0.028	1.028
	(0.039)		(0.038)	
Trading	-0.112**	0.894	-0.114**	0.892
	(0.049)		(0.048)	
Education				
No education	-0.028	0.972	-0.087	0.917
	(0.164)		(0.156)	
Primary education	0.001	1.001	-0.023	1.023
	(0.118)		(0.114)	
Income quintiles				
1st Income quintile	-0.010	0.990	-0.004	0.996
	(0.053)		(0.054)	
2nd Income quintile	0.097	1.102	0.113*	1.120
	(0.065)		(0.064)	
3rd Income quintile	0.075	1.078	0.075	1.078
	(0.063)		(0.062)	
4th Income quintile	0.062	1.064	0.044	1.045
	(0.097)		(0.095)	
Previous pregnancy outcome (1=stillbirth, 0=livebirth)	-0.237***	0.789	-0.245***	0.783
	(0.046)		(0.045)	
Number of children living	0.017	1.017	0.019	1.019
	(0.012)		(0.012)	
GLSS, Dummy=1 for 2012	-0.030	0.970	-0.058	0.944
	(0.041)		(0.041)	
Regional Dummies	No		Yes	
Constant	2.928***	18.690	2.903***	18.229
	(0.236)		(0.228)	
Number of observations	2686		2686	

*, ** and *** indicate statistical significance at 10, 5 and 1% respectively

Note. The MLMP models measure the effect of the explanatory variables on the gestational age at first visit.

Table 4. Mixed Proportional Hazard Model Regression on the Effect of Social Health Insurance on the Probability of Receiving Prenatal Care Using the 2005/2006 GLSSV

	Model 1		Model 2	
Probability of Receiving Prenatal Care	Coefficient	Hazard Ratio	Coefficient	Hazard Ratio
Log of duration	1.821***	6.178	1.979***	7.235
	(0.151)		(0.163)	
Insurance (=1 If individual had health insurance)	0.529**	1.697	0.559**	1.749
	(0.212)		(0.225)	
Demographics				
Age	-0.002	0.998	0.005	0.995
	(0.015)		(0.016)	
Urban (1=Urban, 0 = Rural)	-0.274	0.760	-0.188	0.889
	(0.167)		(0.180)	
Distance to health facility	-0.0005	1.000	-0.0001	1.000
	(0.001)		(0.001)	
Married (1=Married, 0 = Otherwise)	0.321**	1.379	0.542**	1.719
	(0.155)		(0.171)	
Occupation				
Agriculture	-0.091	0.913	-0.155	0.856
	(0.156)		(0.163)	
Trading	0.471**	1.602	0.358	1.430
	(0.216)		(0.224)	
Education				
No education	-3.319***	0.036	-2.813***	0.060
	(1.245)		(1.285)	
Primary education	-3.215**	0.040	-2.942**	0.053
	(1.245)		(1.284)	
Income quintiles				
1st Income quintile	-0.032	0.969	-0.093	0.911
	(0.204)		(0.215)	
2nd Income quintile	-0.346	0.708	-0.415*	0.660
	(0.227)		(0.237)	
3rd Income quintile	-0.142	0.868	-0.063	0.939
	(0.289)		(0.299)	
4th Income quintile	-0.666*	0.514	-0.487	0.614

	(0.374)		(0.382)	
Previous pregnancy outcome (1=stillbirth, 0=livebirth)	0.103	1.108	0.179	1.196
	(0.176)		(0.182)	
Number of children living	-0.005	0.995	-0.045	0.956
	(0.054)		(0.056)	
Regional Dummies	No		Yes	
Constant	-2.529	0.080*	-3.158	0.043
	(1.309)		(1.357)	
Number of observations	12049		12049	

*, ** and *** indicate statistical significance at 10, 5 and 1% respectively

Note. The MPH models measure the effect of the explanatory variables on the probability of receiving prenatal care.

Table 5. Mixed Proportional Hazard Model Regression on the Effect of Social Health Insurance on the Probability of Receiving Prenatal Care Using the 2005 and 2012

	Model 1		Model 2	
Probability of Receiving Prenatal Care	Coefficient	Hazard Ratio	Coefficient	Hazard Ratio
Log of duration	1.588***	4.894	1.686***	5.398
	(0.085)		(0.088)	
Insurance (=1 If individual had health insurance)	0.422***	1.525	0.404***	1.498
	(0.093)		(0.096)	
Demographics				
Age	0.012	1.012	0.012	1.012
	(0.008)		(0.008)	
Urban (1=Urban, 0 = Rural)	-0.074	0.929	-0.116	0.89
	(0.095)		(0.101)	
Distance to health facility	-0.0004	1.000	-0.0001	1.000
	(0.0004)		(0.0004)	
Married (1=Married, 0 = Otherwise)	0.240***	1.271	0.295***	1.343
	(0.092)		(0.097)	
Occupation				
Agriculture	-0.107	0.899	-0.087	0.917
	(0.097)		(0.099)	
Trading	0.228*	1.256	0.252**	1.287

	(0.120)		(0.123)	
Education				
No education	-0.560**	0.571	-0.374	0.688
	(0.233)		(0.239)	
Primary education	-0.350	0.705	-0.265	0.767
	(0.223)		(0.227)	
Income quintiles				
1st Income quintile	0.087	1.091	0.065	1.067
	(0.129)		(0.134)	
2nd Income quintile	-0.205	0.815	-0.253	0.776
	(0.154)		(0.158)	
3rd Income quintile	-0.093	0.911	-0.102	0.903
	(0.160)		0.162	
4th Income quintile	-0.067	0.935	-0.011	0.989
	(0.232)		(0.235)	
Previous pregnancy outcome (1=stillbirth, 0=livebirth)	0.473***	1.605	0.493***	1.637
	(0.103)		(0.105)	
Number of children living	-0.053*	0.948	-0.062**	0.94
	(0.029)		(0.029)	
GLSS	0.155	1.168	0.236	1.266
	(0.101)	1.244	(0.105)	
Regional Dummies	No		Yes	
Constant	-5.721***	0.003	-5.883	0.003***
	(0.385)		(0.403)	
Number of observations	28859		28859	

*, ** and *** indicate statistical significance at 10, 5 and 1% respectively

Note. The MPH models measure the effect of the explanatory variables on the probability of receiving prenatal care.

5. Conclusions and Policy Implications

This paper studies how the introduction of the Ghana National Health Insurance Scheme (NHIS) has changed the gestational age at which pregnant women receive their first prenatal care as well as the probability of women receiving prenatal care. The paper uses survival analysis techniques to model the gestation age at first prenatal visit (time to event). The multilevel multiprocess hazard (MLMP) model and the mixed proportional hazard (MPH) model survival techniques are used to control for unobserved heterogeneity and endogeneity of the insurance status.

The results show that having insurance significantly reduces the gestational age at which a pregnant woman receives her first prenatal care and also increases the probability of a pregnant woman receiving prenatal care.

From a policy perspective this reduction in the timing of the first prenatal visit can help reduce maternal mortality as certain complications can be detected earlier on and prevented or treated and thereby reducing deaths from such complications. The WHO can urge other developing countries to initiate similar social health programs to help produce improved health outcomes.

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Notes

Note 1. Cash and carry is a method of purchase in which the customer must make payment before she can receive service. In the context of this paper, it can be seen as making payment for health care before you receive the necessary treatment.

Note 2. Core poor is defined as the unemployed with no visible source of income, no fixed residence, and not living with someone employed and with a fixed residence).

Note 3. There is statistical significant difference both within and between years.