

## **Multinomial Regression Analysis of Unplanned Pregnancies in Ahafo Ano South District, Ghana**

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### **Abstract**

*In this paper, we explore the incidence of unplanned pregnancies; contraceptive usage; and contributing factors associated with unplanned pregnancies in the Ahafo Ano South District, Ghana. Using a well-structured questionnaire, random sample of 472 expectant mothers who accessed maternity service at healthcare points in the district were interviewed. The data obtained was analyzed using descriptive statistics and multinomial regression. Results indicate that, every 28 out of 59 pregnancies in the district were somehow unplanned; 71.2% of expectant mothers were not using contraceptives, whereas 21.4% and 7.4% uses modern and traditional contraceptives respectively. Age, marital status, abode, educational status, profession, gravity and parity were significant predictive factors of unplanned pregnancy in the district. Again, the study recorded high incidence of teenage pregnancies. In pursuance to these, we recommend the Reproductive and Child Health Unit to intensify education on effective use of modern contraceptives in preventing unplanned pregnancies and its associated risks.*

**Keywords:** multinomial regression, unplanned pregnancy, mistimed pregnancy, Ghana

### **1. Introduction**

A pregnancy is considered unplanned or unintended if it was mistimed or unwanted at the time of conception [1]. In recent times, unplanned pregnancy has invariably become a major public health outcry in the world. It has been documented that out of the world's approximated 210 million pregnancies recorded annually, about 38 percent of the incidence are unplanned and 22 percent end in abortion [2]. Unplanned pregnancies normally give rise to significant number of risk factors which affect maternal and child health. The situation generally leads to low weight babies, preterm birth, infant mortality, unsafe abortions, maternal morbidity and death [3]. In a similar study, Barber and his research Colleagues [4] made known that women whose pregnancies are unplanned have high risk of experiencing poorer health outcomes. According to Bongaats and Westoff [5], 79 million of unintended or unplanned pregnancies do occur throughout the world. Out of this, more than half (46 million) of the pregnancies are terminated before maturity.

A huge number of abortion cases in developing countries are mostly undertaken outside the reach of approved medical facilities and by unskilled persons. These possess several risks to the health of women who patronize such unprofessional services. Unsafe abortion is one of the major catalysts for maternal deaths in many developing countries. A study by the Guttmacher Institute and the United Nations Population Fund [6] revealed that a little over 95 percent incidence of unsafe abortions happens in developing countries.

Out of the 40 million pregnancies that are annually recorded in Africa, 30 percent are unplanned and 20 percent of the pregnancies are aborted by the expectant mothers [2]. In 2003 alone, Africa recorded a total number of 650 maternal deaths per 100,000 unsafe abortions. This number accounted for 14 percent of all maternal deaths cases recorded in the continent [7].

In Ghana, most women of childbearing age are highly exposed to unplanned and at the same instance, unprotected sexual intercourse which mainly account for the increasing occurrence of unwanted pregnancy and its associated risk factors. Studies have shown that quite a large number of women in the country resort to having some level of abortion when they fail to prevent an unplanned pregnancy. Most women who terminate pregnancies in the country do align the foundation of their story to either a mistimed or unwanted pregnancies [8]. According to a briefing document by the Guttmacher Institute [9], 37 percent of all child births in Ghana are unplanned. The document further estimated that more than 300,000 infants are born annually in Ghana as a result of unplanned pregnancies. Johnson and Madise [10] reported that a little above half of fertile women in Ghana are at greater risk of unwanted pregnancies. These pregnancies are usually terminated through the hands of unprofessional attendants and by the use of herbs or concoctions and self-administered drugs, believed to be agents of abortions, which rather result to maternal morbidity and at worse, death. A substantial number of maternal morbidity and deaths in Ghana emanate through the activities of unsafe abortions [11]. Unsafe abortions do account for about 30 percent of maternal deaths in the country [12]. In an attempt to prevent unplanned pregnancy and its risk factors like unsafe abortions and untimely maternal deaths, the Government of Ghana through the Ghana National Population Council decided to use modern family planning methods to fight the menace. In 1994, a target was set to increase the modern contraceptive prevalence rate to 28 percent by 2010 and to 50 percent by 2020 [13]. Notwithstanding the effort by government, Ghana still records high rate of unsafe abortions which to a large extent has its root cause as unplanned or unwanted pregnancies.

Ghana has barely 3 years to achieve the Millennium Development Goals 4 and 5. However, with the increasing rate of unsafe abortions, largely due to unplanned pregnancies, it is worrisome for the country to meet its commitment of reducing maternal and child mortality by 75 percent before 2015. Available statistics has it that Ghana recorded 630 and 350 maternal deaths cases per 100,000 live births in 1990 and 2008 respectively [14]. Another statistics by Lozano and his team [15], estimated 328 maternal deaths per 100,000 live births with 0.9 percent annual rate of decline between 1990 and 2011 was recorded in Ghana. In a recent report, Ghana's, maternal mortality ratio stands at 451 deaths per 100,000 live births [16]. With the slow pace of situation, it would be highly unlikely for Ghana to achieve the set target if urgent pragmatic measures are not embarked to drastically reduce unplanned pregnancies which mainly manifest through the high rate of unsafe abortions and other maternal risk factors.

Although, there has been a lot of researches in different countries, especially in the USA [17,18], which gives detailed analysis of unplanned pregnancies, existing literature in Ghana have failed to scientifically present evidence of factors associated with the increasing cases of unplanned pregnancies. Knowing the contributing factors of unplanned pregnancies in the country may be the first step to reduce unwanted pregnancies and the high rate of unsafe abortions which mainly causes about 30 percent of maternal deaths in Ghana. To this end, this paper explores the contributing factors of unplanned pregnancies in the Ahafo Ano South District. It also assesses the incidence of unplanned pregnancies among expectant mothers in the district. The study then investigates into the usage (or non-usage) of contraceptive methods and its influence on unplanned pregnancies in the district. However, to the best of our knowledge, this study is the first in Ghana and among the few in Sub-Saharan Africa which seek to investigate into the contributing factors of unplanned pregnancies.

The remaining sections of the paper are organized in three (3) main headings: the second section of the paper presents materials and method for the study. Empirical results and a thorough discussion are clearly presented in the third section. The last section gives conclusion and recommendations based on the major findings obtained from the results of the study.

## **2. Materials and Method**

The data for this study was obtained through a well-structured questionnaire, administered to pregnant mothers at the Ahafo Ano South District of Ghana. The survey randomly sampled 1000 pregnant mothers who attended maternity services at healthcare points in the district.

This approach is in line with studies conducted by Rosenfeld and Everett in Northeastern Tennessee [18] and by Amin and Colleagues in the capital cities of Iran and New Zealand [19]. Out of the 1000 questionnaires given to the sampled mothers, 550 questionnaires were successfully retrieved and processed. Of the 550 questionnaires, a total of 472 were well-completed and used for the analysis. The survey which was conducted at the Ahafo Ano South District, Ghana, seeks to examine the intent of women becoming pregnant, at the time just before they became pregnant. The study area is among one of the twenty-one (21) administrative districts/municipalities in the Ashanti region of Ghana. It is located at the North-Western part of the region. It has a total population of about 121,659. Out of the total population in the district, 61,745 are males and 59,914 are females [20]. The traditional occupation of the inhabitant is mainly seen through the high level of agricultural activities in the district.

Ahafo Ano South District has only one hospital which generally serves its populace and people around the catchment areas of the district. The district also has two (2) health centers, six (6) clinics, one (1) maternity home and an orthopedic center, which altogether supplement the only hospital in the in the district. Some of the major towns of the district include Mankranso, Adugyama, Domiabra, Wioso and Abesewa. However, there are several remote communities in the district which are mostly deprived of basic social amenities like hospitals, portable drinking water and enough schools. In order to access quality professional healthcare, Community-Based Health Planning and Services (CHPS) centers have been cited in vantage points of these remote communities. The CHPS centers serve as a readily source of primary healthcare to inhabitants of such communities. Among the deprived communities in the district include Mpasaso Dotiem, Bonkwaso No. 1, Bonkwaso No. 2 and Abasua. Pregnant mothers who reside in either the rural communities or towns in the district were included in the survey which was conducted at all the registered maternity healthcare points in the district.

The survey questionnaire was designed to collect demographic and socio-economic characteristics on pregnant mothers. Among these include: age of the expectant mother, marital status, profession, monthly income, contraceptive method ever-used, parity, gravity, readily source of accessible primary healthcare and desirability of a mother becoming pregnant at the time just before pregnancy is recorded. The responses obtained from the sampled population were analyzed using descriptive statistics and multinomial logistic regression.

Multinomial logistic regression is one of the generalized linear models which show an extension of the binary logistic regression model. It is generally used in cases where response variables have more than two categories or levels. The explanatory variable (s) of the regression model can be either continuous, categorical or both. According to Hosmer and Lemeshow [21], the response variable in the multinomial logistic regression can take more than two categories, but the model would be more interpretable or understandable if the response variable has only three (3) categories. Agresti [22] defined a baseline-category logit model with predictor  $x$  as;

$$\log\left(\frac{\pi_j}{\pi_J}\right) = \alpha_j + \beta_j x, \quad j = 1, \dots, J - 1 \quad (1)$$

where  $\alpha_j$  are the intercepts of the  $J-1$  equations with separate parameters for each equation. In this study, the extent by which respondents intended to get pregnant was used as response variable ( $Y$ ). Pregnancy was classified as “Not intended at all” or unplanned if the pregnant mother did not desire as at the time or in the future to get pregnant. Pregnancy was again classified as “Intended, but not now” or mistimed, if the expectant mother desired to become pregnant in the near future. Lastly, we considered pregnancy as “Intended now” or planned if the mother wanted to get pregnant sooner or just at the particular moment before pregnancy. In the logit model, “Planned” pregnancy was used as a baseline category. The logit model then pairs each of the other two response category with the baseline category. However, the effects of the parameters in the two separate equations do vary with respect to the kind of category paired with the baseline. Responses to some selected items from the survey questionnaire were used as explanatory variables ( $x$ ) in the multinomial regression model.

### 3. Results

Selected characteristics of respondents were analyzed using descriptive statistics. Moreover, the specified multinomial regression model was critically examined and tested for adequacies based on the data obtained from the survey. SPSS version 16.0 was entirely used to obtain all the results reported in the study.

### 3.1 Descriptive Statistics of Respondents Characteristics

Table 1 presents descriptive statistics of pregnancy intent, as distributed over some selected demographic and socio-economic characteristics of respondents. As explained earlier, pregnancy intent was classified into three (3) categories: unplanned, mistimed and planned. Out of the 472 valid respondents, 47.5% (224) reported that their current pregnancies were unplanned; 23.1% (109) stated mistimed and 29.4% (139) described their current pregnancies as planned. From Table 1, unplanned pregnancies were high among women below age 20 (84.2%) and among unmarried women (74.8%). A total of 165 (35%) of the respondents were expectant mothers below age 20. Apart from Catholic women, all other women who affiliate with different denominations recorded a little over 50% cases of unplanned pregnancies. Women who reside in towns in the district also recorded higher (50.2%) cases of unplanned pregnancies than within their counterparts from rural abodes (42.9%). It can be inferred from the table that the risk of experiencing unplanned pregnancy becomes moderately lower in percentages as women climbs the educational ladder in the district. It was again realized that students (74.6%) and unemployed (71.5%) women recorded high cases of unplanned pregnancies in the district. In furtherance, non-income earners were found to have experienced high cases (72.2%) of unplanned pregnancies, as compared to women of high income (16.0%).

In responding to ever-used of contraceptive methods, it was realized that only 35 (7.4%) women rely on traditional contraceptives while 101 (21.4%) subscribes to modern contraceptives. This confirms that most women (71.2%) in the district have over the years feel reluctant to use contraceptives, or perhaps, might have not understand the need to use any of the family planning options. Among users of traditional and modern contraceptives, a substantial number of them (62.9% and 48.5% respectively) still experiences cases of unplanned pregnancies.

From Table 1, women with low gravity recorded 68.0% cases of unplanned pregnancies, whereas those with high gravity had 23.5% cases of unplanned pregnancies amongst them. Out of the 208 women who had never given birth, 155 (74.5%) of them recorded unplanned pregnancy cases. In another situation, women who could easily access healthcare at the only hospital in the district, experience low cases (34.9%) of having unplanned pregnancies, compared to those who accesses healthcare in clinics/maternity homes (54.8%) and in health centers (54.1%).

#### 3.1.1 Results of the Multinomial Regression Model

Results from the fitted multinomial regression for pregnancy intent in the Ahafo Ano South District are presented in Table 2. The table reports the coefficients, standard error of each coefficient, significance, odds ratios and 95% confidence interval (CI) for the odds. In the logit model, pregnancies which were planned were used as a baseline or reference category. Unplanned and mistimed pregnancies were each paired with the baseline category. This resulted to two separate equations in one model fit; unplanned pregnancy paired with planned pregnancy, as baseline, and mistimed pregnancy paired with the same baseline category. In all, twelve (12) explanatory variables were selected and put inside the final model. However, only significant variables, based on 5% significance have been reported in the paper.

With respect to unplanned pregnancy, results from Table 2 indicate that, a woman's marital status, age, place of abode, educational status, profession, gravity and parity were significant contributing factors. Married women were 0.107 times less likely to experience cases of unplanned pregnancies. Women who reside in villages or rural areas in the district were 0.285 times less likely to classify their current pregnancies as unplanned, compared to women living in towns. It can be observed that the higher women attains education, the lower their risk of having classify their pregnancies as unplanned. Women with no formal education were 35.744 times more likely to regard their pregnancies as unplanned. Students from the district were 7.174 times highly prone to have recorded their recent pregnancies as unplanned. Also, women who had never recorded pregnancy or those with low gravity were 10.120 times more likely to classify their recent pregnancies as unplanned. In addition, women who had once or twice given birth were 0.128 times less likely to regard their pregnancies as unplanned.

From the second part of the results in Table 2, marital status, place of abode, educational level, profession and gravity were the contributing covariates which significantly predict mistimed pregnancy. From the table, married women were 0.336 times less likely to classify their pregnancies as mistimed, compared to unmarried women. Villagers or rural settlers were 0.411 times less likely to experience mistimed pregnancies.

It was realized that women with no formal education were 17.003 times more likely to have had mistimed pregnancies. Women who attained basic and secondary levels of education were 10.021 and 10.222 times more likely to classify their current pregnancies as mistimed, compared to those who attained tertiary education. Students were 8.086 more times likely to have classified their pregnancies as mistimed, compared to traders or farmers. Furthermore, women who had never recorded pregnancy or those with once or twice pregnancy experience(s) were 4.830 more times likely to classify their pregnancies as mistimed.

### **3.1.2 Discussion of main findings**

From the results obtained, it could be deduced that 28 out of every 59 recorded pregnancies in the Ahafo Ano South District, end up as unplanned pregnancies. This gives an indication that the district might be at high risk of experiencing unsafe abortions, since most unplanned pregnancies are unwanted. It is widely documented in literature that most unwanted pregnancies mainly results to unsafe abortions [8, 23]. From the results, we attest to the fact that women in rural abodes were less likely to record their recent pregnancies as unplanned, compared to town dwellers. This means that, women who reside in towns at the district are more prone to unplanned pregnancy and its associated health risks.

In addition, women who uses traditional contraceptives to prevent pregnancies, were found to have had high percentage (62.9%) of having unplanned pregnancies, compared to modern contraceptive users (48.5%) and non-users of contraceptives (45.5%). These latter findings, perhaps, suggest that the traditional contraceptive method being used, were either failing to prevent pregnancies or they were not being used correctly. The findings are parallel with a study conducted by Jaeni and his team of researchers [24]. The findings also confirm an earlier pronouncement from a study supervised by the Guttmacher Institute and the United Nations Population Fund. The study claims, an estimated 215 million women who wanted to avoid pregnancy were not using effective method of contraception [6].

To another adverse development, the study revealed a high incidence of teenage pregnancy in the district. From the sampled 472 expectant mothers, it was noticed that 165 (35%) of such mothers were teenagers (mothers below age 20). It was again revealed that illiteracy has a strong significant association with unplanned pregnancy. Women without formal educational background have high likelihood of classifying their pregnancies as unplanned. On the other hand, women who attain higher education (tertiary level) in the district, have moderately low tendencies to record unplanned pregnancy cases. This suggests a low risk of unplanned pregnancy for women of higher educational background. Moreover, as gravity decreases, the proportion of unplanned pregnancies among women in the district becomes high. This wasn't the same for parity. Rather, there was a direct positive relationship between parity and unplanned pregnancy. As the number of parity rises, the proportion of unplanned pregnancies in the district also rises.

### **3.1.3 Assessing the Fit of the Model**

The fit from the logit model was assessed for adequacies. Assessing the adequacy of a model eventually help analysts to make good or precise inferences. A fitted model that shows obvious inadequacies may usually lead to wrong and inaccurate inferences about a situation or factors that cause the occurrence of an event. In this study, we assessed the adequacy of the logit model based on the Pseudo R-square and through the performance of the fit ("Final" model) as against the baseline model ("Intercept only"), by using the likelihood Chi-square test. Due to the high number of subpopulations (cells) with zero frequencies, either the Pearson or the Deviance Chi-square test could not be used to assess the fit.

Under the likelihood Chi-square, we test a model with covariates, against a model without any covariate (null model). The test assumes that there is no significant difference between the null model and the model with covariates. However, results from Table 3 indicate that the fitted logit model significantly (based on 5% significant level) gives adequate predictions as compared to the null or baseline model. This evidently shows that the fit with covariates significantly outperforms the null model with much predictive accuracies. Moreover, results from the Pseudo R-square in Table 4 presents the proportion of variation in the dependent variable (ie., pregnancy intent) that is being explained by the fitted model. In all, close to about 60% (out of a maximum of 100%) of variability in pregnancy intent is explained by the fitted model.

#### 4.0 Conclusion and Recommendations

This study has basically examined the contributing factors of the incidence of unplanned pregnancies in the Ahafo Ano South District, Ghana. From the study, it was realized that, the significant factors which contribute to unplanned pregnancies in the district includes; marital status, age of expectant mothers, place of abode and educational level of women. Others were profession, gravity and parity. In general, users of traditional contraceptives recorded high proportions of unplanned pregnancies, compared to modern contraceptives users and non-users of contraceptives. The study also recorded high cases of teenage pregnancies in the district. In line with the findings from the study, we recommend an intensive education by the Reproductive and Child Health Unit of Ghana Health Service to widely sensitize inhabitants of the district on the use of family planning. The Unit should continually push for the general use of modern contraceptives to prevent unplanned pregnancies. However, these modern contraceptives should be well scrutinized by the Food and Drug Boards to ascertain whether they meet the required standards before allowing the products into the market. Again, there should be enough education on the correct use of modern contraceptives. Women in the district should also be encouraged, not only to pursue formal education, but to climb up the educational ladder to a much higher level.

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**Table 1: Characteristics of Response to Pregnancy Intent by Expectant Mothers**

Variables	Overall Pregnancy Intention (%)			Total(N)	
	Unplanned	Mistimed	Planned		
<b>Age:</b>					
	Below 20	84.2	10.3	5.50	165
	20 - 29	31.0	32.1	37.0	184
	30 and Above	22.8	26.8	50.4	123
<b>Marital Status:</b>	Married	19.7	28.6	51.7	234
	Single	74.8	17.6	7.60	238
<b>Religiosity:</b>	Catholic	36.8	30.7	32.5	114
	Islam	52.0	16.3	31.6	98
	Protestant/Pentecostal	50.2	22.6	27.1	221
	Traditionalist/Others	51.3	20.5	28.2	39
<b>Place of Abode:</b>	Rural/Village	42.9	20.6	36.6	175
	Town	50.2	24.6	25.3	297
<b>Highest Edu:</b>	No formal education	46.0	24.8	29.2	137
	Basic level	54.3	20.4	25.3	269
	Secondary level	29.5	36.4	34.1	44
	Tertiary level	9.10	18.2	72.7	22
<b>Profession:</b>	Unemployed	71.5	15.1	13.4	172
	Student	74.6	19.7	5.60	71
	Employee	16.7	29.6	53.7	54
	Housewife	23.5	35.3	41.2	17
	Trader/Farmer	22.2	29.7	48.1	158
<b>Income:</b>	Non-income earner	72.2	14.9	12.9	241
	Low income earner	22.5	25.0	52.5	80
	Average income earner	22.2	36.5	41.3	126
	High income earner	16.0	28.0	56.0	25
<b>Ever-used of contracept.:</b>	Never	45.5	24.7	29.8	336
	Traditional method	62.9	20.0	17.1	35
	Modern method	48.5	18.8	32.7	101
<b>Gravity:</b>	None/1 – 2	68.0	18.8	13.2	266
	3 – 4	19.6	31.2	49.3	138
	5 and Above	23.5	23.5	52.9	68
<b>Parity:</b>	Never given birth	74.5	13.9	11.5	208
	1 – 2	28.6	31.2	40.2	112
	3 – 4	22.4	32.8	44.8	116
	5 & Above	30.6	19.4	50.0	36
<b>Accessible healthcare:</b>	Hospitals	34.9	19.3	45.8	166
	Health Centre	54.1	26.6	19.4	222
	Clinic/maternity home	54.8	21.4	23.8	84
		<b>47.50%</b>	<b>23.10%</b>	<b>29.40%</b>	<b>472</b>

**Table 2: Parameter Estimates for the Pregnancy Intent Model**

Variable Group <sup>a</sup>	Estimate (B)	Std. Error	Sig	Odds Ratio Exp (B)	95% C.I for Exp (B)	
					lower bound	upper bound
<b>Unplanned</b> Intercept	-1.175	1.557	0.451	*****	*****	*****
<b>Age[Ref:30 &amp; Above]</b>						
Below 20	1.523	0.774	0.049	4.587	1.006	20.920
20-29	0.257	0.520	0.620	1.294	0.467	3.5830
<b>Marital status [Ref: Single]</b>						
Married	-2.235	0.429	0.000	0.107	0.046	0.2480
<b>Abode [Ref: Town]</b>						
Village/Rural	-1.256	0.359	0.000	0.285	0.141	0.5750
<b>Educational Status [Ref: Tertiary level]</b>						
No Formal Education	3.576	1.192	0.003	35.74	3.454	369.88
Basic level	2.898	1.136	0.011	18.13	1.956	168.07
Secondary level	2.266	1.202	0.059	9.638	0.914	101.60
<b>Profession [Ref: Local Trader/Farmer]</b>						
Unemployed	-0.177	0.694	0.799	0.838	0.215	3.2660
Student	1.971	0.886	0.026	7.174	1.263	40.740
Employee	-0.579	0.788	0.463	0.560	0.120	2.6270
Housewife	-0.412	0.830	0.620	0.662	0.130	3.3700
<b>Gravity[Ref:5 and Above]</b>						
None/1 – 2	2.314	0.827	0.005	10.12	2.000	51.207
3 – 4	0.213	0.647	0.742	1.238	0.348	4.400
<b>Parity[Ref:5 and Above]</b>						
Never Given birth	-1.716	1.051	0.102	0.180	0.023	1.409
1 – 2	-2.054	0.941	0.029	0.128	0.020	0.812
3 – 4	-0.427	0.684	0.533	0.653	0.171	2.493
<b>Mistimed</b> Intercept	-3.256	1.389	0.019	*****	*****	*****
<b>Marital status [Ref: Single]</b>						
Married	-1.090	0.417	0.009	0.336	0.149	0.761
<b>Place of Abode [Ref: Town]</b>						
Village/Rural	-0.888	0.340	0.009	0.411	0.211	0.801
<b>Educational Status [Ref: Tertiary level]</b>						
No Formal Education	2.833	0.970	0.003	17.003	2.540	113.817
Basic level	2.305	0.906	0.011	10.021	1.698	59.153
Secondary level	2.325	0.878	0.008	10.222	1.830	57.099
<b>Profession [Ref: Local Trader/Farmer]</b>						
Unemployed	0.118	0.690	0.864	1.125	0.291	4.348
Student	2.090	0.865	0.016	8.086	1.485	44.044
Employee	0.097	0.670	0.885	1.102	0.296	4.097
Housewife	0.015	0.693	0.983	1.015	0.261	3.943
<b>Gravity [Ref:5 and Above]</b>						
None/1 – 2	1.575	0.725	0.030	4.830	1.166	20.000
3 – 4	0.270	0.550	0.624	1.309	0.446	3.846

**Group<sup>a</sup>:** Reference category is "Planned" pregnancy

**Table 3: Model Fitting Information**

Model	Summary Statistics			
	-2log likelihood	Chi-square	df	Sig.
Intercept only	968.023	*****	**	*****
Final	627.275	340.748	52	0.000

**Table 4: Pseudo R-Square**

Summary Statistics	
Cox and Snell	0.514
Nagelkerke	0.586