YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

INFLUENCE OF WOMEN'S EMPOWERMENT ON INFANT MORTALITY IN MYANMAR

BY

AYE NYEIN MOE

Roll No.1

M.P.S

NOVEMBER, 2019

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Submitted by:

Aye Nyein Moe

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Co-supervised by:	**Supervised by:**
Daw Aye Aye Maw	Daw Hla Hla Aye
Associate Professor	Lecturer
Department of Statistics	Department of Statistics
Yangon University of Economics	Yangon University of Economics

NOVEMBER, 2019

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This is to certify that thesis entitled "**INFLUENCE OF WOMEN'S EMPOWERMENT ON INFANT MORTALITY IN MYANMAR"**, submitted as a partial fulfillment towards the requirements of the Degree of Master of Population Studies has been accepted by the Board of Examiners.

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ABSTRACT

This thesis attempts to investigate the impact of women's empowerment on infant mortality in Myanmar. The secondary data used for the study are obtained from the 2015-16 Myanmar Demographic and Health Survey (MDHS). The association between infant mortality and independent variables was assessed using bivariate analysis. Binary logistic regression model is applied to explore the significant factors of infant mortality. Bivariate analysis shows that women's participation in decision making on own health care, mother's age at first birth, place of delivery, mother's employment, mother's education, place of residence, birth order and breastfeeding are significant variables in explaining infant mortality. In the multivariate analysis, women's participation in decision making on own health care, women's participation in decision making on well-being of children, mother's age at first birth, place of delivery, mother's education, breastfeeding and birth interval were significant predictors of infant mortality.

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LIST OF ABBREVIATIONS

CI	Confidence Interval
IMR	Infant Mortality Rate
MDHS	Myanmar Demographic and Health Survey
OR	Odds Ratio
SDG	Sustainable Development Goals
UN	United Nations
UNICEF	United Nations International Children’s Emergency Funds
UNFPA	United Nations Population Fund
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Rationale of the Study

The infant mortality is a widely used indicator of the health status of the entire population as well as the level of development of a country (Reidpath and Allotey, 2003). Infant mortality is the death of young children under the age of one year. The infant mortality rate(IMR), which has declined significantly over time, still remains high in many developing countries and varies widely across countries (Schell et al., 2007; WHO, 2013). High infant mortality rate, which indicates poor health of the population, has important implications at both micro and macro levels. Poor health results is a lower quality of human resources and lower productivity. Efforts are being made and strategies are being developed across all developing countries to reduce infant mortality rate to an acceptable level. According to SDG Goal3, all countries aims to reduce infant mortality below 12 deaths per 1,000 live births and to end in 2030.

The United Nations reported that 32 children per thousand live births died before their first birthday in 2015 (UNICEF, WHO, The World Bank & The Unite Nations, 2015). IMR are 5 per 1,000 live births in developed countries and 35 per 1,000 live births in developing countries (The UN Inter-agency Group for Child Mortality Estimation ET al.2015). According to 2014 Myanmar Demographic and Health Survey, IMR is 40 deaths per 1,000 live births in Myanmar.

Women's empowerment has recently become an important set of measures to include in infant mortality analyses. The issue of women's right, autonomy as well as empowerment have become a subject of serious concern of both academician and policy makers and have received tremendous attention in planning discussions and forums at the national and global platforms in both developed and developing countries. The concept of women's empowerment is instrumentally valuable for achieving positive developmental outcomes and for the well-being of men, women and children. In many developing countries, a man is normally the head of a household and makes most of the household decisions, and the wife experiences no equity in this process (Holland and Hogg, 2001). For instance, men often make decisions regarding major household purchases as they usually control the financial matters that is not important who earns the cash. That is, women become financially more vulnerable and lack autonomy. In such cases, when a woman requires healthcare services, she has to rely on husband's judgement and willingness to spend money on such cares. It can be hypothesized that the higher the participation in the household decision making process by women the higher is the likelihood of receiving heath care, which may increase the survival of the child in a developing country. Furthermore, the influence of women's empowerment on infant mortality has emerged as an issue of considerable research and interest in the developed as well as developing countries.

Women's relative lack of decision-making power and their unequal access to basic health care and other resources are considered to be the root cause of their ill-health and that of their children. As in other many developing countries, high infant mortality has been a major public health problem in Myanmar. But unfortunately, most of the studies on infant mortality do not address the role of women empowerment. Therefore, this thesis aims to examine the impact of women empowerment on infant mortality in Myanmar.

1.2 Objectives of the Study

The objectives of this study are:

i. To investigate the demographic and socio-economic characteristics of ever married women in Myanmar

ii. To examine the relationship between women's empowerment and infant mortality in Myanmar

1.3 Method of Study

Two approaches were used in the data analysis. Descriptive method was analyzed the demographic and socio-economic characteristics among ever married women age 15-49 in Myanmar. Binary logistic regression analysis was used to investigate the impact of women's empowerment on infant mortality in Myanmar.

1.4 Scope and Limitations of the Study

In this study, the effect of women empowerment on infant mortality in Myanmar has been analyzed based on secondary data. The secondary data are obtained from the 2015-16 Myanmar Demographic and Health Survey (MDHS). The study examined only ever married women at the time of the survey who are in the reproductive age (15-49) years.

1.5 Organization of the Study

This study includes five chapters. Chapter I is the introduction which consists of rationale of the study, objectives of the study, scope and limitation of the study, method of study and organization of the study. Chapter II presents the literature review. Chapter III which describes theoretical concepts of logistic regression. Chapter IV deals with the results and findings from the analysis of women empowerment on infant mortality. Chapter V mentions the conclusion of the study with major findings and suggestions of the study.

CHAPTER II
LITERATURE REVIEW

2.1 Empowerment's Factors Associated with Infant Mortality

The 1994 International Conference on Population and Development in Cairo highlighted the importance of women's empowerment and "empowerment of women was legitimated as a social goal and enshrined as a necessary condition for population stabilization". As a consequence, there has been an increasing amount of survey data that include measures such as education, employment, decision-making power, domestic abuse, and empowerment literature originally focused on fertility outcomes, other demographic outcomes have been recently considered, including women's and children's health (Bloom, Wypij & das Gupta, 2001).

Women empowerment has been recognized as one of the most important factors of development and it is identified as one of the development goals of national governments and international agencies (Malhotra and Schuler, 2005).

In a theoretical model Eswaran (2002) analytically shows that if the bargaining power of the wives relative to their husbands increases then it results in a decline in fertility and in child mortality rates. Kravdal (2004) analyzed child mortality in India by using multilevel discrete-time hazard model. This study showed that the lower child mortality is associated with women's empowerment. Similarly, children in households where mothers have high household autonomy and authority, measured as indices of mobility and decision-making power, have a lower risk of post-neonatal child mortality, and greater household authority lowers the risk of child mortality in Bangladesh (Hossain, Phillips, & Pence, 2007). Miles-Doan & Bisharat, (1990) analysed the effect of the mother's autonomy on child nutritional status in Jordan by using multiple regression. The results pointed out that children living in households where the mother's autonomy is higher have better nutritional outcomes.

2.2 Demographic Factors Associated with Infant Mortality

Age of Mother at First Birth

Among women reproductive age (15-49 years), young women are more likely to have higher fertility rate than older women. The UNICEF states those mothers who are younger than 15 years are five times more likely to child death than mothers who are above 20 years. Many studies pointed out that there is strong relationship between maternal age and child mortality.

The Demographic Health Survey (DHS) of three African countries (Kenya, Tanzania, Rwanda) showed that biological and maternal factors such as age of mother, birth interval, birth order and sex of the child are determine factors of infant mortality in principal cities of East Africa Community (Stephen, 2014).

Antenatal Care Visit

Hong and Ruiz-Beltran (2007) use multivariate survival model to analyze infant's survival in Bangladesh. The findings of the study indicate that receiving antenatal care during pregnancy significantly increases infant's survival when other factors are controlled. Maternal age, religion, birth order and antenatal care utilization are also found significant determinants of neonatal mortality in Bangladesh.

Rahman (2013) employs the Cox proportional hazard model to investigate the factors affecting child survival in Bangladesh. The results indicate that antenatal care utilization, place of delivery, and mother's education are important determinants of child mortality in Bangladesh.

Place of Delivery

The effect of socioeconomic status on infant mortality in Uruguay has been studied by Jewell, Martinez and Triunfo (2014). The results of the study indicate that the most important predictors of infant mortality are a full gestational period, mother's educational attainment, marital status, and the type of hospital used for delivery.

Multilevel Cox proportional hazard analysis was used to investigate community –level characteristics for childhood mortality in Nigeria. The results pointed out that the risk of death were lower for children whose mothers residing in communities with high percentage of hospital delivery (Adedini et al., 2015).

2.3 Socio-economic Factors Associated with Infant Mortality

Mother's Employment

The infants may have higher likelihood of survival because of additional expenditure for their wellbeing with the income of the mothers' paid employment. On the contrary, mother's employment may results in less care and infrequent breastfeeding, which may reduce the chance of infants' survival (Shrestha et al., 1987). Thus, the net effect of women employment on infant mortality is uncertain. The studies on India (Kishor and Parasuraman, 1998;) and Indonesia (Titaley, 2008) also find the negative effect of mothers' employment on child survival.

The study on Nepal by Suwal (2001) examined the main determinants of infant mortality using a logistic regression model. The women empowerment measured by employment status shows a positive effect on the infant mortality. That is, the risk of infant's death is high for a working mother compared to a non-working mother. There is no a priori expectation about the effect of women employment on the odds of infant survival. It may be positive or negative.

Mother's Education

Duflo (2011) highlighted three dimensions of women empowerment: (a) education, (b) participation in the decision making process and (c) involvement in economic activities. It is expected that an educated woman is more conscious and more enlightened, which helps her to make better decisions for her as well as for the family. Furthermore, she can communicate and interact with health service providers to get required care for her as well as for her newborn (Bloom et al., 2001). That is, an educated woman has the ability to utilize all available information and resources effectively which reduces the risk of child morbidity and mortality.

A mother's education level "can affect child survival by influencing her choices and increasing her skills in health care practices related to contraception, nutrition, hygiene, preventive care, and disease treatment" (Mosley & Chen, 1984: 35), showing that education mainly operates through proximate determinants such as nutrition and health choices.

Odimegwa (2002) examined determinants of brest-feeding status in Eastern Nigeria by using logistic regression. The results showed that education is a key determinant in decision to breastfeed a baby. Kravdal (2004) analyzed child mortality in India by using multilevel discrete-time hazard model. This study founded that apart from the effect of maternal education on infant mortality in India, the average education of women in an enumeration area also has strong association with infant mortality. The results noted that equitable care for sons and daughters work for the advantage of children born to the educated mothers. Moreover, the higher level of maternal education has the advantage of weakening the effect of short birth interval because women empowerment has increased. Kamal (2012) shows that strong negative association between maternal education and infant mortality by using both bivariate and multivariate analysis in Bangladesh.

Wealth Index

Multilevel Cox proportional hazard analysis was used to investigate regional variation in infant and child mortality in Nigeria. The results showed that the risk of deaths were lower for infant born from rich quintile (Adedini et.al, 2015). Multilevel logistic models were used to study the impact of social determinants of health on child mortality in Bangladesh. The study found that the infants whose mothers with richest wealth quintiles had lower risk of mortality than children who were born to mothers from poorest household wealth (Huda et al.,2016).

Place of Residence

According to the recent DHS of 47 developing countries, there are rural and urban differences in child health; and children in urban has better health outcomes than rural children especially in Latin American and Caribbean Region. However, in some areas, infant mortality is higher in urban area due to rapid urbanization in the developing countries. It leads to the negative impact of urbanization and turns into infant death. In 47 developing countries, child mortality is higher in some urban areas because of the respiratory infection by air pollution of crowed situation and urbanization of cities in some countries and urban-rural effect is not important when controlling the other variables (Ellen et al., 2007). In Myanmar, children living in rural area are more likely to have childhood morbidity and mortality than those living in urban area (Department of Population).

Residence in urban or rural areas is also associated with child mortality such that individuals residing in more urban areas have a lower risk for infant or child mortality than rural areas. Convenience of and access to medical care may play a role in that rural areas tend to have fewer hospitals and individuals may not have available or reliable transportation (Balk et al., 2003). Thus, the place of birth may be tied to area of residence through available locations for where a child is to be born. In addition, health outcomes within urban areas can often be different depending on the location of residence. The study on Nepal by Suwal (2001) examines the main determinants of infant mortality using a logistic regression model and finds that among all variables analyzed parity, place of residence, immunization, and ethnicity are important factors.

2.4 Child Factors Associated with Infant Mortality

Breastfeeding

According to the World Health Organization, the breast feeding is the most nutrient for child and it can decrease the risk of child death. So, the World Health Organization also recommended to promote exclusive breastfeeding to reduce the child mortality mainly in developing countries. The definition of exclusive breastfeeding is to provide breast milk only to children under six months (no water and food).Moreover, providing early initiation of breastfeeding, the first breast milk from the mother which is also called colostrum is recommended for newborn child. There are protective benefits for both mothers and children from breastfeeding. Children who had longer duration of breastfeeding promote development in cognitive and sensory development and increase resistance to fight infection against childhood illness such as diarrhea and acute respiratory tract infection and increased attachment between mothers and children. Moreover, mothers who provided breast milk are decreased chance of breast cancer.

Mothers who are unable to breast feed to their children especially in developing countries, which in turn lead to high mortality rate (Muldoon et al, 2011). Whitworth & Stephenson, 2002 studied birth spacing, sibling rivalry and child mortality in India by using the multilevel modelling approach. If the child has shorter duration of breast feeding, it increased the risk of deaths for infant.

Birth Order and Birth Interval

The birth orders refers to the number of siblings the child has at birth. John Bongaarts stated that the correlation between birth order and child mortality is usually 'J' or 'U' shaped curve; it means the shorter birth interval and high birth order of a mother have high risk of child mortality than small birth orders (Bongaarts, 1987). According to Myanmar 2001 Fertility in Reproductive Health Survey, birth order-children of first, second birth experience higher risk of dying in neonatal period compared with third and fourth ordered birth.

Kembo and Ginneken (2009) expressed some important issue in infant and child mortality in Zimbabwe in their study. In this study found that births of order 6 or more in with a short preceding interval had the highest risk of infant mortality. According to the multilevel Cox proportionate analysis in Nigeria, the findings at the individual level indicated that the risk of deaths were higher for infant with child birth order fifth or above (Adedini et.al, 2015).

Sex of the Child

United Nations conducted in 2011, regarding sex differential in childhood mortality in both developing and developed countries. But the son preference countries like China and India were the only two countries, where female infancy was higher risk of dying than male infancy during year 2000.

Gender and the size of the infant at birth (or birth weight if it is available) are associated with child mortality as well. Male infants tend to have a higher risk of death than females, particularly during the neonatal period (Sullivan, Rutstein, & Bicego, 1994).

Infant mortality is generally higher in male than female in most countries. In general, if the community has no sex-preference, sex ratio at birth is about 105 male per 100 female (Donald, 2013). According to the vital registration data of Maldives (2006) and reproductive health survey of Mongolia (2011), the biological factors of male and female can determine the child mortality (Erdenechimeg, 2011b; Maimoona, 2006). Using data from Demographic Surveillance Centre for Diarrhoeal Disease Research, D'Souza and Chen (1980) found that, in Bangladesh, girl mortality risks are about 60% higher than that of the boys after the neonatal period.

2.5 Environmental Factors Associated with Infant Mortality

Source of Drinking Water and Type of Toilet Facility

Access to safe sanitation latrine and safe drinking water are not only they are critical to the realization of all children's rights in all countries but also for essential for child survival, health and development. At the present time for both developed and developing countries, lack of access to sanitation and water variable including household sanitation factor is becoming the prominent determinant for infant mortality.

Other studies on both developed and developing countries' studies supported the finding on the "lack/access to safe drinking water supply where infant and child mortality is closely related with safe water supply and access to drinking water (Sunday et al., 2012). Nguyen (2013) reported that socioeconomic development promotes the child survival. In developed countries, the clean and safe water and sanitation as well as the high quality of health care services and child care services are crucial for decreasing infant mortality.

2.6 Conceptual Framework

The conceptual framework below shows the various factors that will be conceptualized to independently affect infant mortality. The factors were categorized into child, women and environmental factors.

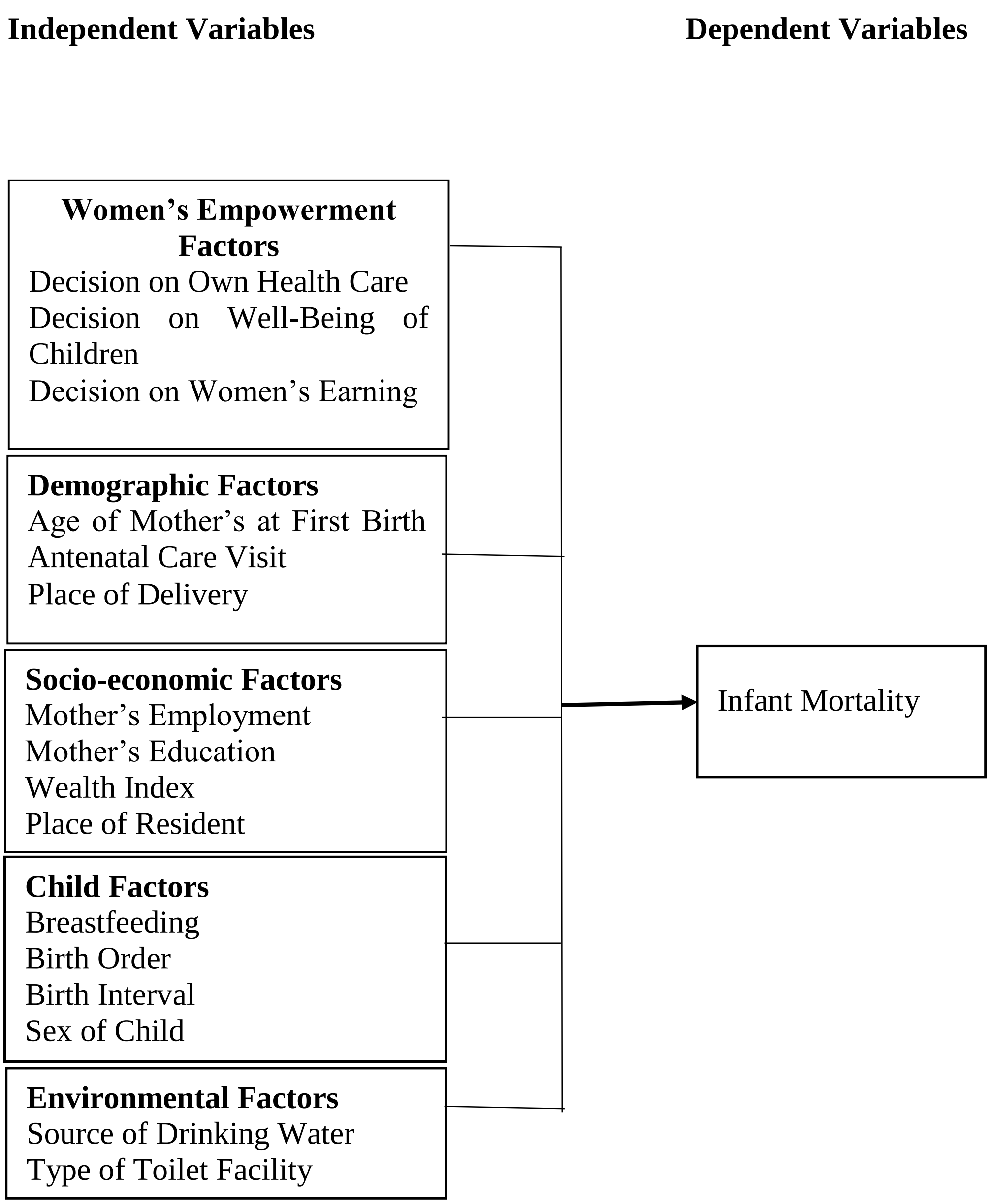

Figure (2.1) Conceptual Framework for the Analysis of Infant Mortality

CHAPTER III
THEORITICAL CONCEPT OF LOGISTIC REGRESSION

3.1 Binary Logistic Regression

Binary logistic regression is regression analysis where the dependent variable is binary. It only contains data coded as 1 or 0. Like other regression models binary logistic regression is also a predictive analysis. The aim of binary logistic regression is to find the model, which describes the relationship between characteristic of interest (dependent variable) and set of independent variables. Before showing how logistic regression general model looks like, let us define odds. Odds of an event are the ratio of the probability that an event will occur to the probability that it will not occur. If the probability of presence of the characteristic of interest is p, the probability of absence of the characteristic of interest is 1-p. Then the corresponding odds is a value given by this formula:

$$odds = \frac{p}{1-\text{p}} = \frac{\text{probability of presence of characteristic}}{probability\ of\ absence\ of\ characteristic} \qquad (3.1)$$

Since logistic regression calculates the probability of an event occurring over the probability of an event not occurring, the influence of independent variables is usually explained in terms of odds. With logistic regression the mean of dependent variable p in terms of independent variable x is given by the equation $p=\alpha + \beta x$. This is not a good model, as values of $\alpha + \beta x$ does not fall between 0 and 1. Logistic regression gives a solution to this problem by transforming the odds using the natural logarithm. With logistic regression we model the natural log odds as a linear function of the independent variable:

$$\text{logit}(y) = \ln(\text{odds}) = \ln\left(\frac{\text{p}}{1-\text{p}}\right) = \alpha + \beta x \qquad (3.2)$$

where p is the probability of interested outcome and x is the independent variable. The parameters of logistic regression are α and β. This is the simple logistic model.

From equation (3.2), an equation for the prediction of the probability as

$$p = \frac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \frac{1}{1+e^{-(\alpha+\beta x)}} \qquad (3.3)$$

Assuming that a general logistic model as

$$logit(y) = \ln\left(\frac{p}{1-p}\right) = \alpha + \beta_1 x_1 + \cdots + \beta_k x_k \qquad (3.4)$$

$$p = \frac{e^{\alpha+\beta_1 x_1+\cdots+\beta_k x_k}}{1+e^{\alpha+\beta_1 x_1+\cdots+\beta_k x_k}} = \frac{1}{1+e^{-(\alpha++\beta_1 x_1+\cdots+\beta_k x_k)}} \qquad (3.5)$$

3.2 Logistic Curve

When the dependent variable is binary and independent variable is numerical, logistic model fits a logistic curve to the relationship between x and y. Logistic curve is a common "S" shape (sigmoid curve).

A simple logistic function is defined by the following formula

$$y = \frac{e^{x}}{1+e^{x}} \qquad (3.6)$$

This equation can be extended to the form

$$y = \frac{e^{\alpha+\beta x}}{1+e^{\alpha+\beta x}} = \frac{1}{1+e^{-(\alpha+\beta x)}} \qquad (3.7)$$

which is graphed in following figure.

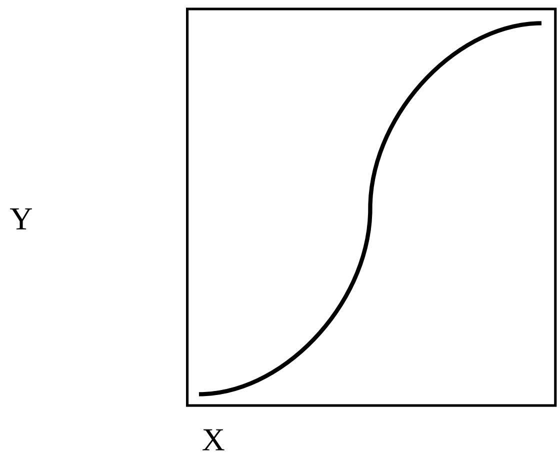

Figure (3.1) shows logistic function, where α is 0 and β is 1.

3.3 Assumptions of Binary Logistic Regression

Unlike general linear models, binary logistic regression does not have many key assumptions, particularly it does not require a linear relationship between the dependent and independent variables, normality of the error distribution, homoscedasticity of the errors and measurement level of the independent variables.

However logistic regression requires other assumptions.

1. Binary logistic regression requires the dependent variables to be binary.
2. Since binary logistic regression assumes that that P(Y=1) is the probability of event occurring, it requires that the dependent variable is coded accordingly.
3. Model should be fitted correctly. It means that all meaningful variables should be included. Also, it should not be over fitted with meaningless variables included.
4. Binary logistic regression requires each observation to be independent. Also, it should have little or no multicollinearity, which means that independent variables are not linear functions of each other.
5. Binary logistic regression requires linearity of the relationship between independent variables and log odds. Meanwhile, it does not require a linear relationship between dependent and independent variables
6. Binary logistic regression requires quite large sample sizes. Studies with small sample sizes overestimate the effect measure. Also the more independent variables are included in the model, the larger sample size is required.

3.4 Maximum Likelihood Estimation

Although logistic regression model looks like simple linear regression model, the underlying distribution is binomial, α and β parameters cannot be estimated in the same way as for simple linear regression. The coefficients are usually estimated by the Maximum Likelihood Model (Park, Hyeoun-Ae, April 2013). The likelihood is a probability to get observed values of the dependent variable given the observed values of independent variables. The likelihood varies from 0 to 1 like any other probabilities.

$$P(Y=y_i) = Pi^{1-y_i}(1-Pi)^{y_i} \tag{3.8}$$

where Pi is the probability of the i-th observation, y_i is the value of random variable Y that takes value 0 or 1. Assuming that our n observations are independent the likelihood of the data is equal to

$$L = \prod_{i=1}^{n} \boldsymbol{Pi}^{\mathbf{1}-y_i} (\mathbf{1} - \boldsymbol{Pi})^{y_i} \qquad (3.9)$$

Maximum Likelihood method will provide values for α and β which maximise L function.

3.5 Evaluation of Binary Logistic Regression Model

Firstly, the overall model should be evaluated. Secondly, the significance of every explanatory variable needs to be assessed.

3.5.1 Likelihood Ratio Test

Due to overall model evaluation we can see how strong the relationship between all independent variables and dependent variable is. If logistic regression with k independent variables demonstrates an improvement over the model without independent variables (null model), then it provides a better fit to data (Park, Hyeoun-Ae, April 2013). This is performed using the likelihood ratio test, which compares the likelihood of the data under the full model with the likelihood of the data under the model without independent variables. The overall fit of the model with k coefficients can be accessed via likelihood ratio test which tests the null hypothesis

$$H_0: \beta_1 == \ldots = \beta_k$$
$$H_1: \text{At least } \beta_i \neq 0 \qquad (3.10)$$

-2 log likelihood of the null method is compared with 2 log likelihood of the given model. Likelihood of null method is the likelihood of obtaining the observation if explanatory variables have no impact on the outcome. Likelihood of the given model is likelihood of obtaining the observation if all explanatory variables are included in the model.

The difference of these 2 indicates a goodness of fit index G, χ^2 statistic with k degrees of freedom. It measures how well independent variables influence on the dependent variable.

$$G=\chi 2= (\text{-2 log likelihood of null model}) - (\text{-2 log likelihood of the given model}) \quad (3.11)$$

If the p-value for the overall model fit statistic is less than 0.005, then decline H_0 with the conclusion that at least one of the independent variables has impact on the outcome or dependent variable.

3.5.2 Chi-square Goodness of Fit Tests

Chi-square goodness of fit test is a non-parametric test that is used to find out how the observed value of a given event is significantly different from the expected value. The hypothesis for Chi-square goodness of fit test is as follows.

Null hypothesis: There is no significant difference between the observed and expected value.

Alternative hypothesis: There is significant difference between the observed and expected value. If the p-value is less than significance level, the null hypothesis is rejected.

In linear regression residuals are defined as $y_i - \hat{y}_i$ where y_i is the observed value of the variable for i-th subject, and $\hat{y}_i$ is the predicted value for i-th subject. For logistic regression, where y_i is 1 or 0, the corresponding prediction from the model is as

$$\hat{y}_i = \frac{exp(\alpha+\beta_1 x_{i1}+\cdots+\beta_k x_{ik})}{1+exp(\alpha+\beta_1 x_{i1}+\cdots+\beta_k x_{ik})} \quad (3.12)$$

Chi-square test is based on residuals$y_i - \hat{y}_i$. A standardized residual is defined as

$$r_i = \frac{y_i-\hat{y}_i}{\sqrt{\hat{y}_i(1-\hat{y}_i)}} \quad (3.13)$$

and χ^2 statistic can be formed as

$$\chi^2 = \sum_{i=1}^{n} r_i^2 \quad (3.14)$$

This statistic follows χ^2distribution with n-(k+1) degrees of freedom.

3.5.3 Hosmer-Lemeshow Test

Hosmer-Lemeshow test also measures how good the model is. The test evaluates whether observed event rates match expected event rates in subgroups of the model population. Hosmer-Lemeshow test is implemented by dividing the predicted probabilities into ten equal groups, according to their values (deciles).

The hypotheses is as follows

H_0: Actual and predicted event rates are similar across 10 deciles.

H_1: They are not the same.

The value of the test statistics is

$$\chi^2 = \sum_{g=1}^{10} \frac{(O_g - E_g)^2}{E_g} \tag{3.15}$$

Where O_g are the observed events, and E_g are the expected events for the g-th risk decile group. The test statistic asymptotically follows a χ^2 distribution with 8 (number of groups-2) degrees of freedom. Small values with large p-value closer to 1 means a good fit to the data. Large values with $p < 0.05$ means a poor fit to the data.

3.5.4 Cox and Snell R-Square

Cox and Snell's presents the R-squared as a transformation of the statistic of

$$-2ln\left[L\left(M_{Intercept}\right)/L(M_{Full})\right] \tag{3.16}$$

That is used to determine the convergence of a logistic regression. The ratio of the likelihoods reflects the improvement of the full model over the intercept model (the smaller the ratio, the greater the improvement). The Cox and Snell R-square is

$$R^2 = 1 - \left[\frac{L\left(M_{Intercept}\right)}{L(M_{Full})}\right]^{2/N} \tag{3.17}$$

L(M) is the conditional probability of the dependent variable given the independent variables. If there are N observations in the dataset, then L(M) is the product of N such probabilities. Thus, taking the n^{th} root of the product L(M) provides an estimate of the likelihood of each Y value. Cox and Snell's pseudo R-squared has a maximum value that is not 1. If the full model predicts the outcome perfectly and has a likelihood of 1, Cox and Snell's R-square will be $(1\text{-}L(M_{Intercept})^{2/N})$, which is less than one.

3.5.5 Nagelkerke R-Square

It adjusts Cox and Snell's so that the range of possible values extends to 1. To achieve this, the Cox and Snell R-Squared is divided by its maximum possible value, $1\text{-}L\left(M_{Intercept}\right)^{2/N}$.

$$R^2 = \frac{1-\left[\frac{L\left(M_{Intercept}\right)}{L\left(M_{Full}\right)}\right]^{2/N}}{1-L\left(M_{Intercept}\right)^{2/N}} \tag{3.18}$$

Then, if the full model perfectly predicts the outcome and has a likelihood of 1, Nagelkerke R-Square will equal one.

3.6 Statistical Significance of Individual Regression Coefficients

After evaluating the overall model, the next step is to assess the significance of every independent variable. The coefficient of i-th explanatory variable indicates the change in the predicted log odds for one unit change in the i-th explanatory variable, when all other explanatory variables remain unchanged.

3.6.1 Likelihood Ratio Test

The likelihood ratio test is used to evaluate the overall fit model. The test is also used to evaluate statistical significance of individual predictors. The likelihood ratio test for particular parameter compares the likelihood of obtaining the data when the parameter is 0 (L_0) with the likelihood (L_1) of obtaining the data evaluated at the MLE of the parameter. The test statistic is calculated as

$$G = -2\ln\frac{L_0}{L_1} = -2(\ln L_0 - ln\ L_1) \tag{3.19}$$

This statistics is compared with χ^2 distribution with 1 degree of freedom.

3.6.2 Wald Statistic

The Wald statistic is used to test the significance of individual coefficients in a given model (Bewick et al., 2005). The statistic is the ratio of the square of the regression coefficient to the square of standard error of the coefficient. The calculation is as follows

$$Wj = \left(\frac{coefficient}{SEcoefficient}\right)^2 \qquad (3.20)$$

Each Wald statistic is compared with a χ^2 distribution with 1 degree of freedom. The calculation of Wald statistic is easy. However, the reliability of the test is questionable, particularly for small samples. For data that produces large estimates of coefficient, the standard error is often inflated, which in turn results in a lower Wald statistic. Consequently, explanatory variable may be incorrectly assumed as insignificant in the model.

3.7 Variables Description

The dependent variable of this study is infant mortality. It have been defined as the death of young children under the age of one year. In this analysis, the survival status of infant is further recorded as '1' if the child died between 0 to 12 months from birth to dead and alive equals to 0. The selected some variables that include decision on women's health car, decision on well-being of children decision on women's earning, age of mother's at first birth, antenatal care visit, place of delivery, mother's employment, mother's education, wealth index, place of residence, sex of child, birth order, birth interval, breastfeeding, source of drinking water and toilet facility are expected to be associated with infant mortality.

Variables	Definition	Code
Decision on Own Health Care	Person who usually decides on own health care	1=Without involvement of women; 2= With involvement of women
Decision on Well-being of Children	Person who usually decides on well-being of children	1=Without involvement of women; 2= With involvement of women
Decision on Women's earning	Person who usually decides on women's earning	1=Without involvement of women; 2= With involvement of women
Age of Mother's at First Birth	Age of mother at first birth	1=15-24,2=25-34, 3=35-44
Antenatal Care Visit	Number of antenatal care visit	1=less than 2 times; 2=2-3 times; 3= 4 times or more
Place of Delivery	Place of Delivery	1= Home 2=Hospital/Health care center/NGO/ 3= Others
Mother's Employment	Employment condition of the mother	1=No; 2=Yes
Mother's Education	Educational attainment of the mother	1= Illiterate; 2= Literate
Wealth Index	Wealth quartile of the mother	1=Poorest ;2= Poorer; 3=Middle; 4= Richer; 5= Richest
Place of Residence	Type of place of residence	1= Rural, 2= Urban

Variables	Definitions	Code
Sex of Child	Sex of the child	1=Male; 2= Female
Birth Order	Birth rank of the child	1= 1^{st}; 2=2^{nd}-3^{rd}; 3= 4^{th}-5^{th}; 4 = $6^{th} or\ more$
Birth Interval	Preceding birth interval between the current birth and previous birth	1= less than 2year; 2=2year-3year; 3= 4year or more
Breastfeeding	Currently breasting	1=No; 2 Yes
Source of Drinking Water	Access to drinking water	1=Pipe/Tub well/ Rain/ Bottle/Protected water; 2= Unprotected water;3=Others
Toilet Facility	Family access to sanitation facilities	1=No; 2 Yes

CHAPTER IV
RESULTS AND FINDINGS

4.1 Introduction

This chapter presents the results of the study based on descriptive statistics, bivariate and multivariate analyses. The first part of this chapter is comprised of descriptive statistics. Inferential statistics were done using binary logistic regression models for both bivariate and multivariate analyses.

4.2 Descriptive Statistics

The frequency and percentage distribution of women's empowerment, demographic and socioeconomic factors, child's factors and environmental factors are presented in the following tables.

Table (4.1) Percentage Distribution of Women's Empowerment Factors

Women's Empowerment Factors	No. of Respondent	Precent(%)
Decision on Own Health Care		
Without involvement of women	2727	59.4
With involvement of women	1861	40.6
Decision on Well-Being of Children		
Without involvement of women	4227	92.1
With involvement of women	361	7.9
Decision on Women's earning		
Without involvement of women	1160	51.4
With involvement of women	1099	48.6

Data Source: MDHS (2015-16)

According to the Table (4.1) and Figure (4.1), women's participation in different decision making were 40.6% on own health care, 7.9% on wellbeing of children and 48.6% on women's earning . Women's 59.4% without participation in decision making on own health care, 92.1% without participation in decision making on wellbeing of children and 51.4% without participation in decision making on women's earning.

The women’s participation in decision making are also shown in Figure (4.1).

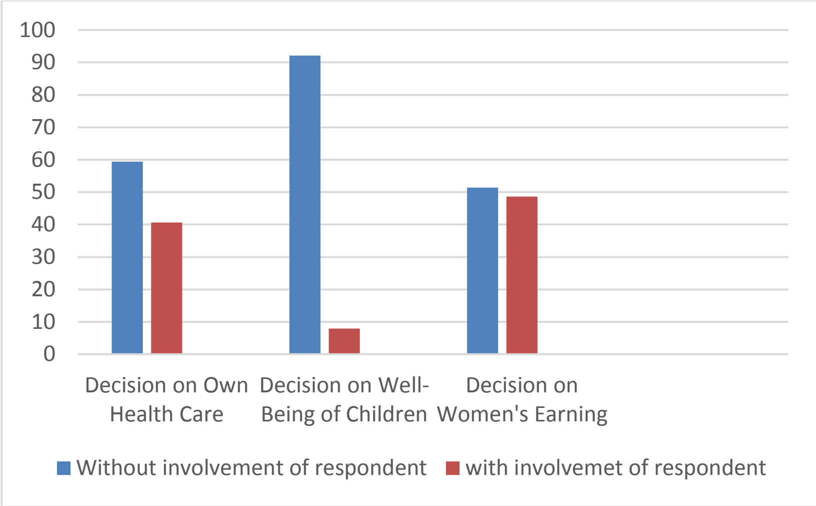

Figure (4.1) Women’s Participation in Decision Making

Data Source: Table (4.1)

Table (4.2) Percentage Distribution of Women’s Demographic Factors

Women’s Demographic Factors	No. of Respondent	Precent(%)
Age of Mother’s at First Birth		
15-24	3293	71.8
25-34	1217	26.5
35-44	78	1.7
Antenatal Care Visit		
less than 2 times	669	14.6
2-3times	916	20.0
4 or more times	3003	65.5
Place of Delivery		
Home	3017	65.8
Hospital/Health care center/NGO	1558	34.0
Others	13	0.3

Data Source: MDHS (2015-16)

According to the Table (4.2), the highest proportion (71.8%) of the women whose age at first birth was 15-24 and 26.5% of the women whose age at first birth was 25-34. The lowest proportion (1.7%) of the women whose age at first birth was 35-44. The distribution of respondents by antenatal care visits shows that 65.5% receive 4 or more visits, another 20.0% receive two to three visits and remaining 14.6% receive less than 2 visits. The children delivered at institution places such as hospital, health care centre and NGO were 34.0% while home deliveries accounted as 65.8%. The lowest proportion (0.3%) of the children delivered at others.

Table (4.3) Percentage Distribution of Women's Socio-economic Factors

Women's Socio-economic Factors	No. of Respondent	Precent(%)
Mother's Employment		
No	2163	47.1
Yes	2425	52.9
Mother's Education		
Illiterate	804	17.5
Literate	3784	82.5
Wealth Index		
Poorest	1405	30.6
Poorer	1053	23.0
Middle	826	18.0
Rich	743	16.2
Richest	561	12.2
Place of Residence		
Rural	3623	79.0
Urban	965	21.0

Data Source: MDHS (2015-16)

According to the Table (4.3), considering employment condition of the mother, 52.9% of the mother are employed and 47.1% of the mother are unemployed. The proportion of women whose literate was 82.5% while only 17.5% of the women are illiterate. Regarding percentage of wealth index of children of the mothers, poorest constituted the highest proportion by 30.6%, poorer had 23.0%, middle had 18%, rich had 16.2% and richest had 12.2%. Furthermore, 79% of the women lived in rural areas.

Table (4.4) Percentage Distribution of Child Factors

Child Factors	No. of Respondent	Precent(%)
Breastfeeding		
No	1938	42.2
Yes	2650	57.8
Birth Order		
One	1466	32.0
Two- Three	1860	40.5
Four-Five	758	16.5
Six or more	504	11.0
Birth Interval		
less than 2 years	507	11.1
2years-3years	722	15.7
4years or more	3359	73.2
Sex of Child		
Male	829	18.1
Female	3759	81.9

Data Source: MDHS (2015-16)

According to the Table (4.4), 57.8% was children who were breast fed by their mothers and 42.2% was no breast fed children. The first birth order composed with 32.0%, 2^{nd} and 3^{th} birth order was 40.5% and the birth order with 4^{th} and 5^{th} was 16.5% .The percentage of birth order 6^{th} or more is 11%. Birth interval below 2 years children were 11.1% whereas birth interval between 2 to 3 years were 15.7%. The percentage of children with birth interval more than 4 years were 73.2%.The proportion of sex of child were 52.6% males and 47.4% females.

Table (4.5) Percentage Distribution of Environmental Factors

Environmental Factors	No. of Respondent	Precent(%)
Source of Drinking Water		
Pipe/ Tub well/ Rain/ Bottle/Protected Water	3472	75.7
Unprotected water	979	21.3
Others	137	3
Type of Toilet Facility		
No Facilities/Bush/Field	829	18.1
Yes	3759	81.9

Data Source: MDHS (2015-16)

According to the Table (4.5), the majority of the respondents 75.7% accessed safe drinking water while 21.3% accessed unprotected water and 3% accessed others . Similarly, the majority of the respondents 81.9% have toilet facility and remaining 18.1% did not have toilet facility.

Table (4.6) Age Distribution of Infant Mortality

Age of infant mortality(months)	No. of Infant	Precent (%)
0	126	57.8
1	21	9.6
2	12	5.5
3	10	4.6
4	4	1.8
5	4	1.8
6	5	2.3
7	4	1.8
8	3	1.4
9	3	1.4
10	1	0.5
11	4	1.8
12	4	1.8
Total	201	100

Data Source: MDHS (2015-16)

According to Table (4.6) and Figure (4.2), the number of infants who died before one month were 126.There were 21 infants who died during one month. The number of infants who died in two and three month were 21 and 12.Out of a total of 201 infant deaths, five infant died in six month and three infants died not only eight month but also nine month. Only one infant who died during ten month. Four number of infants were died in four, five, seven, eleven and twelve months respectively.

The age distribution of infant mortality is shown also in Figure (4.2).

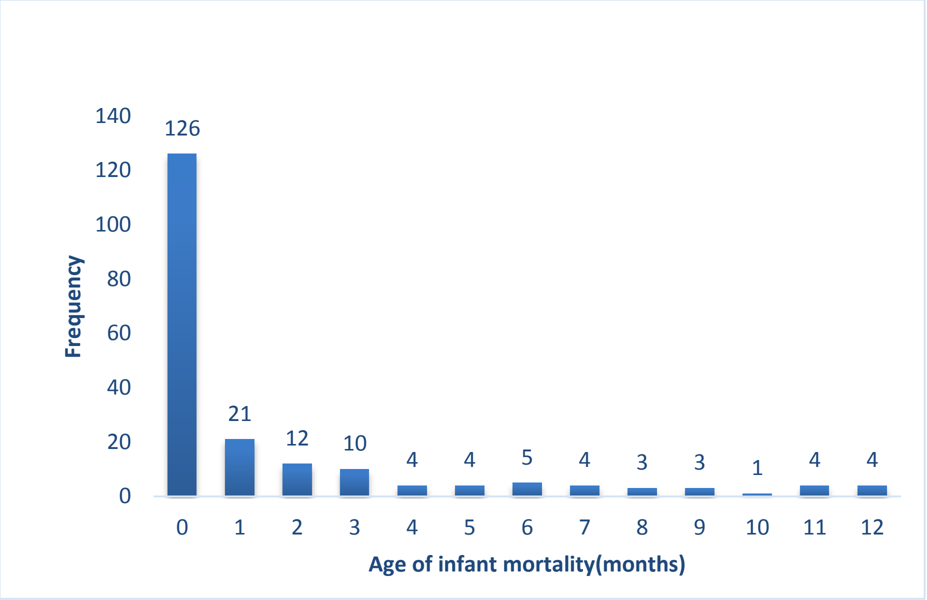

Figure (4.2) Age distribution of infant mortality

Data Source: Table (4.6)

4.3 Bivariate Analysis

The bivariate analysis is used to investigate the association between each variable in the study with infant mortality.

Table (4.7) Pearson Chi Square Test between Infant Mortality and Women's Empowerment Factors

Women's Empowerment Factors	Dead	Alive	p-value
Decision on Own Health Care			
Without involvement of women	122(59.4)	2605(64.9)	
With involvement of women	66(35.1)	1795(40.8)	0.069
Decision on Well-Being of Children			
Without involvement of women	173(92.0)	4054(92.1)	
With involvement of women	15(8.0)	346(7.9)	0.954
Decision on Women's earning			
Without involvement of women	43(45.7)	1117(51.6)	
With involvement of women	51(54.3)	1048(48.4)	0.267

Data Source: MDHS (2015-16)

Table (4.7) shows that there is a significant association between women's participation in decision making on own health care and infant mortality. It can be observed that infant mortality is high for infant whose mother's without involvement in decision making on own health care. However, the two others women's participation in decision making variables are no association with infant mortality.

Table (4.8) Pearson Chi Square Test between Infant Mortality and Women's Demographic Factors

Demographic Factors	Dead	Alive	p-value
Age of Mother's at First Birth			
15-24	130(69.1)	3163(71.9)	
25-34	51(27.1)	1166(26.5)	
35-44	7(3.7)	71(1.6)	0.085
Antenatal Care Visit			
less than 2 times	34(18.10	635(14.4)	
2-3 times	41(21.8)	875(19.9)	
4 or more times	113(60.1)	2890(65.7)	0.242
Place of Delivery			
Home	146(77.7)	2871(65.3)	
Hospital/Health care center/NGO	39(20.7)	1519(34.5)	
Other	3(1.6)	10(0.2)	0.000

Data Source: MDHS (2015-16)

Table (4.8) shows that among three demographic variables, two variables were association with infant mortality. There is a significant association between age of mother at first birth and infant mortality. It has been found that infant mortality is highest for infant whose mother's age at birth was 15-24 and lowest for infant whose mother's age at birth was 35-44. Women with less than 2 antenatal care visits have the lowest percentage of infant mortality and women with 4 or more antenatal care visits have the highest percentage of infant mortality. However, there is no significant association between antenatal care visit and infant mortality.

There is a significant association between place of delivery and infant mortality. It can be observed that the mothers who gave birth at home have the highest percentage of infant mortality compared with the rest of places of delivery.

Table (4.9) Pearson Chi Square Test between Infant Mortality and Women's Socio-economic Factors

Socio-economic Factors	Dead	Alive	p-value
Mother's Employment			
No	71(37.8)	2092(47.5)	
Yes	117(62.2	2308(52.5)	0.009
Mother's Education			
Illiterate	50(26.6)	754(17.1)	
Literate	138(73.4)	3646(82.9)	0.001
Wealth Index			
Poorest	59(31.4)	1346(30.6)	
Poorer	39(20.7)	1014(23.0)	
Middle	35(18.6)	791(18.0)	
Rich	32(17.0)	711(16.2)	
Richest	23(12.2)	538(12.2)	0.966
Place of Resident			
Rural	159(84.6)	3464(78.7)	
Urban	219(15.4)	936(21.3)	0.054

Data Source: MDHS (2015-16)

Table (4.9) shows that there is a significant association between mother's employment and infant mortality. It can be observed that the percentage of infant mortality is high for infants whose mothers have work.

There is a significant association between mother's education and infant mortality. It can be observed that the percentage of infant mortality is high for infants whose mothers were literate. There is no significant association between wealth index and infant mortality. It can be found that percentage of infant mortality is high for infants in poor family and low for infants in richest family. There is also a significant association between place of resident and infant mortality. It can be concluded that infant mortality is higher in rural area compared to urban area.

Table (4.10) Pearson Chi Square Test between Infant Mortality and Child Factors

Child Factors	Dead	Alive	p-value
Birth Order			
One	46(24.5)	1420(32.3)	
Two- Three	70(37.2)	1790(40.7)	
Four-Five	38(20.2)	720(1.4)	0.002
Six or more	34(18.1)	470(10.7)	
Breastfeeding			
No	123(65.4)	1815(41.3)	
Yes	65(34.6)	2585(50.8)	0.000
Birth Interval			
less than 2 years	22(11.7)	485(11.0)	
2years-3years	22(11.7)	700(15.9)	
4years or more	144(76.6)	3215(73.1)	0.300
Sex of Child			
Male	109(58.0)	2304(52.4)	
Female	79(42.0)	2096(47.6)	0.131

Data Source: MDHS (2015-16)

Table (4.10) shows that there is a significant association between birth order and infant mortality. Infant mortality is highest for infant who were second and third babies of their parents and lowest for infant who were the six or more babies of their parents. There is also a significant association between breastfeeding and infant mortality. It can be observed that percentage of infant mortality is high for infant whose mother has not breastfeeding.

There is no significant association between birth interval and infant mortality. The percentage of infant mortality is high for infant who has more than 4 years birth interval. Moreover, there is no significant association between sex of child and infant mortality. It can be observed that infant mortality for female infant is lower than male infant.

Table (4.11) Pearson Chi Square Test between Infant Mortality and Environmental Factors

Environmental Factors	Dead	Alive	p-value
Source of Drinking Water			
Pipe/ Tub well/ Rain/Bottle/ Protected Water	136(72.3)	3336(75.8)	
Unprotected Water	45(23.9)	934(21.2)	
Others	7(3.7)	130(3.0)	0.531
Type of Toilet Facility			
No Facilities	38(20.2)	791(18.0)	
Yes	150(79.8)	3609(82.0)	0.435

Data Source: MDHS (2015-16)

Table (4.11) shows that source of drinking water and toilet facility are not significant association with infant mortality. It can be found that percentage of infant mortality is high among infant who utilized protected water and toilet facility.

4.4 Binary Logistic Regression

In this study, infant mortality has been taken as a dependent variable where empowerment, demographic, socio- economic and environmental factors consider as independent variables.

Therefore, binary logistic regression equation is:

$$\text{logit}(y) = \ln(\text{odds}) = \ln\left(\frac{p}{1-p}\right) = \alpha + \beta_i X_i$$

$$= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 \beta_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16}$$

where

Y_i= Infant Mortality

β_0= Constant

X_1= Decision on Own Health Care

X_2= Decision on Well-Being of Children

X_3= Decision on Women’s Earning

X_4= Age of Mother’s at First Birth

X_5= Antenatal Care Visit

X_6= Place of Delivery

X_7= Mother's Employment

X_8= Mother's Education

X_9= Wealth Index

X_{10}= Place of Resident

X_{11}= Breastfeeding

X_{12}= Birth Order

X_{13}= Birth Interval

X_{14}= Sex of Child

X_{15}=Source of Drinking Water

X_{16}= Type of Toilet Facility

4.5 Multivariate Analysis

In multivariate analysis, the results of overall model evaluation of binary logistic regression model are shown in Table (4.12).

Table (4.12) Overall Model Evaluation for Infant Mortality with Significant Independent Variables

	Chi-square	df	p-value
Omnibus Tests of Model Coefficients	79.796	26	0.000
Hosmer and Lemeshow	6.087	8	0.637
-2Log Likelihood	701.961		
Cox and Snell R Square	0.035		
Nagelkerke R Square	1.119		
Overall Correct Prediction	95.9		

Data Source: MDHS (2015-16)

According to the omnibus tests of model coefficients, the model of infant mortality with women's participation in decision making on major household purchases, place of delivery, antenatal care visits, place of residence, birth order, mother's education, wealth indices, previous birth interval and breastfeeding is significant(chi-square=79.796, df=26, p=0.000).The model fitting information includes two different ways of estimating R square (Cox and Snell R square and Nagelkerke R Square) .These "Pseudo" R square estimates indicate that 3.5% of variation in infant mortality and 11.1% of variation in infant mortality can be explained by the variation in independent variables. Overall, 95.9% of the participant were predicted correctly.

Table (4.13) Binary Logistic Regression Model of Infant Mortality

Variables	B	S.E.	Wald	df	P value	Exp(B)	95% C.I.	
							Lower	Upper
Decision on Women's Earning								
Without involvement of Women (ref.)								
With involvement of Women	.289	.220	1.727	1	.189	1.335	.868	2.053
Decision on Own Healthcare								
Without involvement of Women (ref.)								
With involvement of Women	-.425*	.232	3.350	1	.067	.654	.414	1.031
Decision on Wellbeing of Children								
Without involvement of Women (ref.)								
With involvement of Women	-.882*	.532	2.750	1	.097	.414	.146	1.174
Mother's Age at First Birth								
15-24 (ref.)								
25-34	-.070	.263	.070	1	.791	.933	.557	1.562
35-44	1.481**	.507	8.543	1	.003	4.396	1.629	11.866
Antenatal Care Visit								
Less than 2 times (ref.)								
2-3 times	-.242	.351	.476	1	.490	.785	.395	1.561
4times or more	-.426	.306	1.938	1	.164	.653	.359	1.189

Table (4.13) Binary Logistic Regression Model of Infant Mortality (cont.)

Variables	B	S.E.	Wald	df	P value	Exp(B)	95% C.I.	
							Lower	Upper
Place of Delivery								
Home (ref.)								
Hospital/Health care Center/ NGO	-.423	.286	2.178	1	.140	.655	.374	1.149
Others	1.696*	.940	3.255	1	.071	5.450	.864	34.387
Mother's Employment								
No (ref.)								
Yes	.274	.232	1.390	1	.238	1.315	.834	2.072
Mother's Education								
Illiterate (ref.)								
Literate	-.613**	.265	5.347	1	.021	.542	.322	.911
Wealth Index								
Poorest (ref.)								
Poorer	.003	.294	.000	1	.991	1.003	.564	1.785
Middle	-.697*	.371	3.531	1	.060	.498	.241	1.030
Richer	-.166	.338	.240	1	.624	.847	.437	1.642
Richest	.007	.355	.000	1	.984	1.007	.502	2.020
Place of Residence								
Rural (ref.)								
Urban	.086	.316	.074	1	.785	1.090	.586	2.027
Birth Order								
1 (ref.)								
2-3	.470	.309	2.315	1	.128	1.599	.874	2.928
4-5	.594	.367	2.617	1	.106	1.811	.882	3.721
6 or more	.891**	.380	5.487	1	.019	2.438	1.157	5.137
Breastfeeding								
No (ref.)								
Yes	-1.029***	.229	20.173	1	.000	.357	.228	.560
Birth Interval								
Less than 2 years								
2-3years	-.531	.539	.969	1	.325	.588	.205	1.691
4years or more	.332	.394	.710	1	.399	1.394	.644	3.021

Table (4.13) Binary Logistic Regression Model of Infant Mortality (cont.)

Variables	B	S.E.	Wald	df	P value	Exp(B)	95% C.I.	
							Lower	Upper
Sex of Child								
Male (ref.)								
Female	-.283	.221	1.647	1	.199	.753	.489	1.161
Source of Drinking water								
Pipe/ Tub well/ Rain/Bottle/ Protected	-.079	.266	.088	1	.766	.924	.549	1.556
Unprotected water	.605	.597	1.024	1	.312	1.830	.568	5.903
Others								
Toilet Facility								
Yes	-.164	.289	.323	1	.570	.849	.482	1.495
Constant	-2.163***	.642	11.337	1	.001	.115		

*** denotes significant at 1% level, ** denotes significant at 5% level and * denotes significant at 10% level

Data Source: MDHS (2015-16)

Women's participation in decision making on own health care had a statistically significant effect on infant mortality. Decision making on own health care shows a negative effect on infant mortality. Women who were involved in the decision-making process on own health care were 0.654 times less likely to experience infant mortality than those who were not involved in the decision–making process on own health care (95% CI, 0.414 -1.031).

Women's participation in decision making on well-being of children had a statistically significant effect on infant mortality. Decision making on well-being of children shows a negative effect on infant mortality. Women who were involved in the decision-making process on well-being of children were 0.414 times less likely to experience infant mortality than those who were not involved in the decision–making process on well-being of children (95% CI, 0.146 -1.174). A women who have empowerment are more likely to have a higher level of contraceptive use, which might lessen their behavior risks, prolong birth interval, lower fertility and result in lower infant mortality.

Women's participation in decision making on women's earning had no significant effect on infant mortality. Therefore, women who were involved in the decision-making process on women's earning were 1.335 times more likely to experience infant mortality than those who were not involved in the decision–making process on well-being of children (95% CI, 0.868 -2.053).

Mother's age at first birth had a significant effect on infant mortality. Infants from women aged 25 - 34 years old were 0.933 times less likely to die compared to infants from women aged 15 -24 years old (95% CI, 0.557-1.562). Infants from women aged 35-44 years old were 4.396 times more likely to die compared to infants from women aged 15-24 years old(95% CI, 1.629-11.866).

Women with 2 or 3 antenatal care visits were 0.490 times less likely of their infant die compared to those who have no or one antenatal care visit (95%CI, 0.395-1.561). Therefore, the odds ratio of antenatal care with 2 or 3 visits is 0.490 but is not significant at acceptable level. The odd ratio of antenatal care with 4 or more visits shows the value of 0.164, which indicates that women with 4 or more antenatal care visits were 0.164 times less likely of their infant die compared to those who have no or one antenatal care visit (95%CI,0.359-1.189).

The delivery place of infant is one of determinants for infant mortality and infants who delivered at institution places were 0.655 times less likely to die than those of infants delivered at home(95% CI, 0.374 -1.149), but is not significant at acceptable level However, place of delivery at others are significant effect on infant mortality. Infants who delivered at other places were 5.450times more likely to die than those of infants delivered at home (95% CI, 0.3864-34.387). Unassisted births had a greater risk of infant mortality. Women who deliver at institutional places ensure the accessibilities emergency care either mothers or children when both of them are facing with delivery complications. According to the findings, the children whose mothers have better demographic conditions are less likely to die before the age of one.

Among socio-economic factor, employed mothers were 1.315 times more likely to experience infant mortality than unemployed mothers (95% CI, 0.834 -2.072). Mother's employment may results in less care and infrequent breastfeeding, which may reduce the chance of infants' survival.

The odd ratio of mother's education is found to be 0.542 and it had significant effect on infant mortality. This indicates that literate mothers were 0.542 times less likely to experience infant mortality than illiterate mothers (95% CI, 0.322-0.911).

There is a negative relationship between mother's education and infant mortality. The reasons for these findings may be due to the fact that more educated mothers are better equipped and knowledgeable about antenatal care and better feeding practices. Moreover, education can contribute to children's survival by making women more likely to have fewer children and immunize their children.

The odd ratios of wealth indices imply that the probabilities of infant survival increase with the increase in wealth. The odd ratios of poorer indicates that the poorer women were 1.003 times more likely to experience infant mortality than poorest women (95%CI, 0.564 -1.785). However, wealth index (middle) had a statistically significant effect on infant mortality. The odd ratios of middle indicates that women from middle were 0.498 times less likely to experience infant mortality than poorest women (95%CI, 0.241 -1.030). The chances of infant survival is expected to be 0.847 times higher if the child is born in a richer family compared to a poorest family (95%CI, 0.437 -1.642). The odd ratios of richest indicates that the richest women were 1.007 times more likely to experience infant mortality than poorest women (95%CI, 0.0.502 -2.020). It can be observed that infants from poor families couldn't spend their limited resources on well-being of their children meanwhile rich families afford resources needed for providing and receiving care.

The odd ratio of urban is 1.090 suggesting that infants born in urban areas are expected to survive less compared to their counterparts in the rural areas (95% CI, 0.586-2.027). However, this variable is not significant at acceptable level. According to the findings, the children whose mothers have better socio-economic conditions are less likely to die before the age of one.

The odd ratio of birth order is 0.767 suggests that the survival of the infant decreases by about 1.599 times if mother give two or three births (95% CI, 0.874 - 2.928). Likewise the survival of their infants were 1.811 times more likely among women who give four or five births compared to women who give one birth(95% CI, 0.822-3.721). Similarly, women give six or more births were 2.438 times more likely to experience infant mortality compared to women who give one birth (95% CI, 1.157-5.137). The birth order six or more is significant effect on infant mortality. If the number of children in the family is less, the probability of illness and death in children will be reduced. High birth order may effect both maternal and fetal health as well as availability of time for child care.

Breastfeeding with an odd ratio of 0.357 is one of the most important factors reducing infants' death. The odd ratio of this variable shows that those mothers, who provide breastfeeding have 0.357 times lower probability of their infants to die compared to others, who do not provide breastfeeding(95% CI, 0.228-0.560). It can be observed that breastfeeding may provide require nutrients which help develop baby's immune system and subsequently increase the probability of survival. Therefore, breastfeeding is a safe and well- nutritious food for the infants.

The birth interval was statistically significant effect on infant mortality. The odd ratio of birth interval is 0.588 indicating that infants' deaths are expected to be about 0.588 times lower if mothers' previous birth interval is 2 to 3 years compared to their reference category (95% CI, 0.205 -1.691). Women with birth interval 4 or more have 1.394 more likely of their infant die than reference category (95% CI, 0.644-3.021). The reasons may be the effect that mothers waited for two years before having the next child would have refilled most nutrients from body requirements and blood loss during delivery previous pregnancy and breastfeeding. The shorten birth interval is also one of the risk factor of pregnancy. Female infant were 0.753 times less likely to die compared to male infant (95% CI, 0.489-1.161). However, sex of child is not significant effect on infant mortality.

Source of drinking water and type of toilet facilities were not significant effect on infant mortality. Therefore, infant who utilized unprotected water were 0.924 times less likely to die compared to infant who utilized protected water (95%CI, 0.549-1.556). However, Infant who utilized other source of drinking water were 1.830 times more likely to die compared to infant who utilized protected water (95% CI, 0.568-5.903). Furthermore, infant who had toilet facility were 0.849 times less likely to die compared to infant who had no toilet facility (95%CI, 0.482-1.495).

CHAPTER V
CONCLUSION

Infant mortality is one of the most important indicators of the socioeconomic and health status of a community. This study investigated whether the women's empowerment has an effect on infant mortality. The data set employed in this study is secondary data of 2015-2016 Myanmar Demographic and Health Survey (MDHS). Bivariate analysis shows that women's participation in decision making on own health care, mother's age at first birth, place of delivery, mother's employment, mother's education, place of residence, birth order and breastfeeding are important variables in explaining infant mortality. The multivariate analysis supported most of the findings of the bivariate analysis. In the multivariate analysis, women's participation in decision making on own health care, women's participation in decision making on well-being of children, mother's age at first birth, place of delivery, mother's education, breastfeeding and birth interval were significant predictors of infant mortality.

The results from binary logistic regression, the child whose mother's without participation in decision making on own health care are more likely to experience compared with the child whose mother's participation in decision. Similarly, the child whose mother's without participation in decision making on well-being of children are more likely to experience compared with the child whose mother's participation in decision. Therefore, an empowered women had more control over her own and child health care, which eventually reduce infant mortality.

This study found that infant mortality is higher in women who give birth at too young age and too old age which may be related to biological factors that can lead to the occurrence of complications during pregnancy and at delivery. If the child delivery takes place at home, it will have the higher infant mortality risk. Although institutional delivery has been promoted in Myanmar, home delivery is still common. This results implies that delivery at a health facility, with skilled medical attention and hygienic conditions reduces complications and infections during delivery.

This study also showed that the literate mothers have a lower experience of infant deaths. Educated mothers having more knowledge may have better information on health and nutrition related practices. It leads to significant reduction in infant mortality risk. Moreover, education can contribute to infant's survival by making women more likely to marry and give birth later and to have fewer children and immunize their children. Another reason could be that school are institutions that transform young girls into empowered and confident women.

According to the results, the infant mortality risk is less likely among infant who are breastfed compared to those who are not breastfed. Survival of infant can be increased substantially if child is provided breastfeeding. The shorten birth interval is the greater infant mortality risk. Therefore, child factor such as longer birth interval of preceding birth and receiving breastfeeding would reduce the infant mortality risk.

Further research should be conducted women's empowerment on infant mortality by constructing women' empowerment index. Moreover, research about women's empowerment and infant mortality including all empowerment variables and religion, size of the child, delivery with assistance using other method of studies should be conducted.

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APPENDIX

Infant death and Decision on Wellbeing of Children

Crosstab

			Decision on Wellbeing of Children		Total
			without involvement of respondent	involvement of respondent	
Infant death	No	Count	4054	346	4400
		% within infant death	92.1%	7.9%	100.0%
		% within Decision on Wellbeing of Children	95.9%	95.8%	95.9%
	Yes	Count	173	15	188
		% within infant death	92.0%	8.0%	100.0%
		% within Decision on Wellbeing of Children	4.1%	4.2%	4.1%
Total		Count	4227	361	4588
		% within infant death	92.1%	7.9%	100.0%
		% within Decision on Wellbeing of Children	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.003[a]	1	.954		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.003	1	.954		
Fisher's Exact Test				.890	.518
Linear-by-Linear Association	.003	1	.954		
N of Valid Cases	4588				

Infant Death and Decision on Own Healthcare

Crosstab

			Decision on own healthcare		Total
			without involvement of respondent	involvement of respondent	
Infant death	No	Count	2605	1795	4400
		% within infant death	59.2%	40.8%	100.0%
		% within decision on own healthcare	95.5%	96.5%	95.9%
	Yes	Count	122	66	188
		% within infant death	64.9%	35.1%	100.0%
		% within decision on own healthcare	4.5%	3.5%	4.1%
Total		Count	2727	1861	4588
		% within infant death	59.4%	40.6%	100.0%
		% within decision on own healthcare	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.420[a]	1	.120		
Continuity Correction[b]	2.190	1	.139		
Likelihood Ratio	2.459	1	.117		
Fisher's Exact Test				.129	.069
Linear-by-Linear Association	2.420	1	.120		
N of Valid Cases	4588				

Infant Death and Decision on Women's earning

Crosstab

			Decision on Women's earning		
			without involvement of respondent	involvement of respondent	Total
Infant death	No	Count	1117	1048	2165
		% within infant death	51.6%	48.4%	100.0%
		% within Decision on women's earning	96.3%	95.4%	95.8%
	Yes	Count	43	51	94
		% within infant death	45.7%	54.3%	100.0%
		% within Decision on women's earning	3.7%	4.6%	4.2%
Total		Count	1160	1099	2259
		% within infant death	51.4%	48.6%	100.0%
		% within Decision on women's earning	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.234[a]	1	.267		
Continuity Correction[b]	1.011	1	.315		
Likelihood Ratio	1.234	1	.267		
Fisher's Exact Test				.292	.157
Linear-by-Linear Association	1.233	1	.267		
N of Valid Cases	2259				

Infant Death and Age at first birth

Crosstab

			Age at first birth			Total
			15-24	25-34	35-44	
Infant death	No	Count	3163	1166	71	4400
		% within infant death	71.9%	26.5%	1.6%	100.0%
		% within Age at first birth	96.1%	95.8%	91.0%	95.9%
	Yes	Count	130	51	7	188
		% within infant death	69.1%	27.1%	3.7%	100.0%
		% within Age at first birth	3.9%	4.2%	9.0%	4.1%
Total		Count	3293	1217	78	4588
		% within infant death	71.8%	26.5%	1.7%	100.0%
		% within Age at first birth	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.935[a]	2	.085
Likelihood Ratio	3.782	2	.151
Linear-by-Linear Association	1.738	1	.187
N of Valid Cases	4588		

Infant death and Number of antenatal visits during pregnancy

Crosstab

			Number of antenatal visits during pregnancy			
			less than 2 times	2-3 times	4 or more times	Total
Infant death	No	Count	635	875	2890	4400
		% within infant death	14.4%	19.9%	65.7%	100.0%
		% within Number of antenatal visits during pregnancy	94.9%	95.5%	96.2%	95.9%
	Yes	Count	34	41	113	188
		% within infant death	18.1%	21.8%	60.1%	100.0%
		% within Number of antenatal visits during pregnancy	5.1%	4.5%	3.8%	4.1%
Total		Count	669	916	3003	4588
		% within infant death	14.6%	20.0%	65.5%	100.0%
		% within Number of antenatal visits during pregnancy	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.840[a]	2	.242
Likelihood Ratio	2.741	2	.254
Linear-by-Linear Association	2.835	1	.092
N of Valid Cases	4588		

Infant Death and Place of delivery

Crosstab

			Place of delivery			Total
			Home	Hospital/ Health care center/NGO	Others	
Infant death	No	Count	2871	1519	10	4400
		% within infant death	65.3%	34.5%	0.2%	100.0%
		% within Place of delivery	95.2%	97.5%	76.9%	95.9%
	Yes	Count	146	39	3	188
		% within infant death	77.7%	20.7%	1.6%	100.0%
		% within Place of delivery	4.8%	2.5%	23.1%	4.1%
Total		Count	3017	1558	13	4588
		% within infant death	65.8%	34.0%	0.3%	100.0%
		% within Place of delivery	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.218[a]	2	.000
Likelihood Ratio	21.610	2	.000
Linear-by-Linear Association	9.483	1	.002
N of Valid Cases	4588		

Infant death and Mother's Education

Crosstab

			Mother's Education		Total
			illiterate	literate	
Infant death	No	Count	754	3646	4400
		% within infant death	17.1%	82.9%	100.0%
		% within Mother's Education	93.8%	96.4%	95.9%
	Yes	Count	50	138	188
		% within infant death	26.6%	73.4%	100.0%
		% within Mother's Education	6.2%	3.6%	4.1%
Total		Count	804	3784	4588
		% within infant death	17.5%	82.5%	100.0%
		% within Mother's Education	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.162[a]	1	.001		
Continuity Correction[b]	10.517	1	.001		
Likelihood Ratio	10.017	1	.002		
Fisher's Exact Test				.002	.001
Linear-by-Linear Association	11.160	1	.001		
N of Valid Cases	4588				

Infant death and Mother's Employment

Crosstab

			Mother's employment		Total
			No	Yes	
Infant death	No	Count	2092	2308	4400
		% within infant death	47.5%	52.5%	100.0%
		% within Mother's employment	96.7%	95.2%	95.9%
	Yes	Count	71	117	188
		% within infant death	37.8%	62.2%	100.0%
		% within Mother's employment	3.3%	4.8%	4.1%
Total		Count	2163	2425	4588
		% within infant death	47.1%	52.9%	100.0%
		% within Mother's employment	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.920[a]	1	.009		
Continuity Correction[b]	6.533	1	.011		
Likelihood Ratio	7.009	1	.008		
Fisher's Exact Test				.009	.005
Linear-by-Linear Association	6.918	1	.009		
N of Valid Cases	4588				

Infant death and Wealth index combined

Crosstab

			Wealth index combined					Total
			Poorest	Poorer	Middle	Richer	Richest	
Infant death	No	Count	1346	1014	791	711	538	4400
		% within infant death	30.6%	23.0%	18.0%	16.2%	12.2%	100.0%
		% within Wealth index combined	95.8%	96.3%	95.8%	95.7%	95.9%	95.9%
	Yes	Count	59	39	35	32	23	188
		% within infant death	31.4%	20.7%	18.6%	17.0%	12.2%	100.0%
		% within Wealth index combined	4.2%	3.7%	4.2%	4.3%	4.1%	4.1%
Total		Count	1405	1053	826	743	561	4588
		% within infant death	30.6%	23.0%	18.0%	16.2%	12.2%	100.0%
		% within Wealth index combined	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.577[a]	4	.966
Likelihood Ratio	.588	4	.964
Linear-by-Linear Association	.024	1	.877
N of Valid Cases	4588		

Infant Death and Place of Residence

Cross tabulation

			Place of residence		Total
			1.00	2.00	
Infant death	No	Count	3464	936	4400
		% within infant death	78.7%	21.3%	100.0%
		% within Place of residence	95.6%	97.0%	95.9%
	Yes	Count	159	29	188
		% within infant death	84.6%	15.4%	100.0%
		% within Place of residence	4.4%	3.0%	4.1%
Total		Count	3623	965	4588
		% within infant death	79.0%	21.0%	100.0%
		% within Place of residence	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.711[a]	1	.054		
Continuity Correction[b]	3.368	1	.066		
Likelihood Ratio	3.983	1	.046		
Fisher's Exact Test				.055	.030
Linear-by-Linear Association	3.711	1	.054		
N of Valid Cases	4588				

Infant death and Sex of child

Crosstab

			Sex of child		Total
			Male	Female	
Infant death	No	Count	2304	2096	4400
		% within infant death	52.4%	47.6%	100.0%
		% within Sex of child	95.5%	96.4%	95.9%
	Yes	Count	109	79	188
		% within infant death	58.0%	42.0%	100.0%
		% within Sex of child	4.5%	3.6%	4.1%
Total		Count	2413	2175	4588
		% within infant death	52.6%	47.4%	100.0%
		% within Sex of child	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.280[a]	1	.131		
Continuity Correction[b]	2.060	1	.151		
Likelihood Ratio	2.292	1	.130		
Fisher's Exact Test				.136	.075
Linear-by-Linear Association	2.279	1	.131		
N of Valid Cases	4588				

Infant death and Birth order

Crosstab

			Birth order				Total
			1	2-3	4-5	6-12	
Infant death	No	Count	1420	1790	720	470	4400
		% within infant death	32.3%	40.7%	16.4%	10.7%	100.0%
		% within birth order	96.9%	96.2%	95.0%	93.3%	95.9%
	Yes	Count	46	70	38	34	188
		% within infant death	24.5%	37.2%	20.2%	18.1%	100.0%
		% within birth order	3.1%	3.8%	5.0%	6.7%	4.1%
Total		Count	1466	1860	758	504	4588
		% within infant death	32.0%	40.5%	16.5%	11.0%	100.0%
		% within birth order	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.578[a]	3	.002
Likelihood Ratio	13.362	3	.004
Linear-by-Linear Association	13.720	1	.000
N of Valid Cases	4588		

Infant death and Birth Interval

Crosstab

			Birth Interval			Total
			less than 2 year	2-3 year	more than 4 year	
Infant death	No	Count	485	700	3215	4400
		% within infant death	11.0%	15.9%	73.1%	100.0%
		% within Birth Interval	95.7%	97.0%	95.7%	95.9%
	Yes	Count	22	22	144	188
		% within infant death	11.7%	11.7%	76.6%	100.0%
		% within Birth Interval	4.3%	3.0%	4.3%	4.1%
Total		Count	507	722	3359	4588
		% within infant death	11.1%	15.7%	73.2%	100.0%
		% within Birth Interval	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.409[a]	2	.300
Likelihood Ratio	2.595	2	.273
Linear-by-Linear Association	.321	1	.571
N of Valid Cases	4588		

Infant death and Breastfeeding

Crosstab

			Breastfeeding		Total
			No	Yes	
Infant death	No	Count	1815	2585	4400
		% within infant death	41.3%	58.8%	100.0%
		% within Breastfeeding	93.7%	97.5%	95.9%
	Yes	Count	123	65	188
		% within infant death	65.4%	34.6%	100.0%
		% within Breastfeeding	6.3%	2.5%	4.1%
Total		Count	1938	2650	4588
		% within infantdeath	42.2%	57.8%	100.0%
		% within onefeed	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	43.190[a]	1	.000		
Continuity Correction[b]	42.205	1	.000		
Likelihood Ratio	42.694	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	43.181	1	.000		
N of Valid Cases	4588				

Infant death and Type of Toilet Facility

Crosstab

			toilet		Total
			No facilities/ Bush/Field	Yes	
Infant death	No	Count	791	3609	4400
		% within infant death	18.0%	82.0%	100.0%
		% within toilet facility	95.4%	96.0%	95.9%
	Yes	Count	38	150	188
		% within infant death	20.2%	79.8%	100.0%
		% within toilet	4.6%	4.0%	4.1%
Total		Count	829	3759	4588
		% within infant death	18.1%	81.9%	100.0%
		% within toilet facility	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.609[a]	1	.435		
Continuity Correction[b]	.467	1	.494		
Likelihood Ratio	.592	1	.442		
Fisher's Exact Test				.439	.244
Linear-by-Linear Association	.608	1	.435		
N of Valid Cases	4588				

Infant Death and Source of Drinking Water

Crosstab

			Source of Drinking Water			
			Pipe/Tube well/ Protected water	River/Dam/ Spring/Stream/Tank/Unprotected water	Others	Total
Infant death	No	Count	3336	934	130	4400
		% within infant death	75.8%	21.2%	3.0%	100.0%
		% within Source of Drinking Water	96.1%	95.4%	94.9%	95.9%
	Yes	Count	136	45	7	188
		% within infant death	72.3%	23.9%	3.7%	100.0%
		% within Source of Drinking Water	3.9%	4.6%	5.1%	4.1%
Total		Count	3472	979	137	4588
		% within infant death	75.7%	21.3%	3.0%	100.0%
		% within Source of Drinking Water	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.265[a]	2	.531
Likelihood Ratio	1.221	2	.543
Linear-by-Linear Association	1.259	1	.262
N of Valid Cases	4588		