APPLICATION OF LOGISTIC REGRESSION IN IDENTIFYING KEY DETERMINANTS OF DOMESTIC VIOLENCE IN KENYA

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DECLARATION

CANDIDATE

This project is my original work and has not been presented for a degree in any other university.

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DEDICATION

I dedicate this work to my lovely children, Kelsey, Abigail and Claire

ABSTRACT

The purpose of this study was to investigate the factors affecting domestic violence in Kenya. Kenya Demographic and Health Survey (KDHS) 2008-9, data was used for analysis. Several factors were identified for analysis. Chi square test was done on identified variables to check if there exists a relationship between them and experiencing domestic violence. Logistic regression was used for analysis. This research study identified the factors affecting domestic violence in Kenya as: The region of stay, religion, ethnicity, current marital status, wife rank number, woman education level, type of earnings for work done, literacy level of woman, wealth index, alcoholism, and intergenerational culture of violence.

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CHAPTER 1: INTRODUCTION

1.1 Background

Domestic violence is one of the gender-based violence that has the highest effect on an individual's social and emotional status. It involves sexual, physical, and emotional abuse. Depending on the traditions and the law of the land, the issue about domestic violence has had varied reactions. In some settings like African culture, domestic violence against a woman by the husband had been traditionally accepted since it was purported that the husband had legal right to his wife's body. However, the damage caused by such violence has led many countries to legislate laws that ensure that women have legal protection against domestic violence.

Domestic violence has both direct and indirect costs since it affects the victim's health, physical and psychological status. The indirect cost involves the amount of healthy working days lost when a victim is rendered less productive due to injuries. Injuries from physical violence, particularly, have a higher impact on the victim's health. Some of the injuries are long-term, even when the relationship is terminated due to intolerance of the victim's partner. While injuries like cuts and bruises can be short term, miscarriage, bony injuries, loss of hearing and vision can have long-term effects (Fraser, 2003). The extreme cases of domestic violence lead to death of the victims. Although there could be under-reporting of partner homicides, it is estimated that three out of five deaths in Australia are caused by domestic violence between intimate partners (Fraser, 2003). The deaths are often associated with a long history of domestic violence between partners. For example, the death of a partner from liver failure after a long-term effect of violence may still be attributed to the violence regardless of when it happened. However, cost of violence has been underestimated in many societies. This is because, there are very few social controls placed on domestic violence, especially in a patriarchal society where male assertiveness is key.

Some of the determinants of domestic violence are based on laws put in place for domestic violence, society characteristics, individual characteristics, household and marital characteristics. National laws against domestic violence have been seen to reduce incidences of domestic violence. The rate of enforcement of the laws also determines how the society respects the law. Individuals living in violent societies like war and internal conflict are more likely to view

violence as a normal occurrence. Thus, such a society will allow domestic violence to thrive than what a nonviolent society will do. A nonviolent society will impose tough laws against any form of violence, hence setting a cover on domestic violence.

Society access to resources determines the degree of domestic violence exhibited by household. Research has shown that modernization, which brings resources closer to the people, improves woman's status in the society hence facilitating a decrease in gender differences. In such a society, the cost placed on domestic violence is relatively high, thus it works as a buffer against domestic violence. A modernized society does not respect patriarchal settings, thus women empowerment allows a decrease in violence.

However, a general understanding of the determinants of the domestic violence in developing countries like Kenya has been very slim. This is because previous research has focused on domestic violence against women with a view that men are always right in whichever decision they make. In other settings, domestic violence has had varied descriptions with marriage sexual violence being less considered as violence. A number of violence prevention efforts have been put in place on gender based violence. Victim safety and support have been put in place while violence perpetrators have been held accountable. However, the community setting and percentage of perpetrators in a community has been left open to reported cases**.** For example, polygamy, high poverty index, female seclusion and early marriages, and high illiteracy levels among women characterize the community setting in Kenya. In such a community, domestic violence is not a legal but social issue. This study will seek to address the determinant of violence with an eye on the type of community that such violence cases thrive.

1.2 Problem Statement

The topic on domestic violence and its determinants has been studied in varied dimensions. Among them are partner violence, child mistreatment, and violence against women friends' violence, acquaintances violence, and stranger attacks. However, very few researchers have considered the community setting as having a key contribution to domestic violence. Utilizing already identified factors, this research project will investigate the determents of domestic violence with a case study of Kenya as a community.

1.3 Research Objectives

The broad objective of the research is to model the determinants of domestic violence within community setting in Kenya.

The specific objectives are;

1. To identify the key determinants of domestic violence
2. To measure the effect of each determinant of domestic violence

1.3 Significance of the Study

Understanding community setting and the contribution of such a setting to domestic violence is key to law enforcer's implementation of set regulations. This study will come in handy in exposing the predisposing factors for domestic violence even as it seeks to advise the policy makers on how well they can handle identified issues. The study will also be useful to students and researchers who will venture into modeling social setting characteristics.

CHAPTER 2: LITERATURE REVIEW

2.1 Domestic Violence and Its Implication to Women

Domestic violence cases have raised mixed feelings on the causes and remedy to the problem. Several researchers have delved into the topic with varied dimensions. Toufique and Razzaque (2007) conducted a research on the determinants and implications of domestic violence against women. Using a Bangladesh household data, the researcher explored the social economic status around domestic violence. Education and social economic status of the woman are seen as key determinants to domestic violence against women in that women with higher education levels will be better placed economically thus they will face violence less often. The research also revealed that women's accessibility to income generating activities either funded or personal initiative report few cases of violence. This is because such women are able to access household food and non-food items that are normally a common source of domestic chaos. Arthur and Clark (2009) agree with Toufique and Razzaque (2007) on the issue of economic empowerment. Economic dependency reduces the woman's comparative status, thus limiting them from accessing resources like political, education and economic resources.

Fraser (2003) did a research on domestic violence and women's physical health. The researcher investigated the short and long-term impacts of domestic violence on women's physical health. Among the injuries related to domestic violence are; cuts, bruises, black eyes, miscarriage, bony injuries, spleeny and liver trauma, partial loss of hearing or vision, and scars from burning or knife wounds, breast and chest injuries and abdomen in battered women, fractures, dislocations and twisted wrist and lower arm (Fraser, 2003). The cases when presented to a health facility are treated as emergency cases, since one is never sure the extent of the injury. Many patients have often shown signs of mental health issues like depression and drug abuse.

2.2 Theories on Domestic Violence

Just like Toufique and Razzaque (2007), Arthur and Clark (2009) did a cross-national study of determinants of domestic violence. Using an economic dependency theory, a patriarchal theory, resource theory, an exchange theory, a modernization theory, and a culture of violence theory, cross-societal differences in domestic violence were tested. Among the determinants of domestic violence they identified were; the wish to be in control over a partner, violent response to an

abuse, and community set up. For example, a patriarchal family structure has a higher intensity of domestic violence against women, especially when the man's superiority is threatened. Among the threats are a woman's access to education and higher job positions than the man. Therefore, gender equality was seen as a solution to social discrimination against any gender.

2.3 Domestic Violence Victim Behaviors

Ask (2009) conducted a survey on police officer's perception on crime victim behavior. With a sample size of 400 Swedish law personnel, he was able to realize that rape and domestic violence had a majority of victims. He noted that victims of domestic violence and rape were susceptible to expressive self-presentation and self-blame. Self-presentation can be in two ways, the negative and controlled style. The negative style involves tenseness, crying and sobbing whenever the issue is mentioned while the controlled style involves hiding emotional reaction by remaining calm and composed when the event is mentioned. Of the two styles, the negative style presents the victim as more true than the controlled one. However, the victim-offender relationship changes which at times lead to rare cases of planned revenge.

2.4 Factors Contributing to Domestic Violence

Koenig et al. (2006) conducted a research on determinants of domestic violence in Northern India. The researchers expounded on individual contribution of socioeconomic, demographic, sociocultural and intergeneration to domestic violence. They further investigated the effects of economic development, gender, wife beating norms, and violent crime levels to the overall domestic violence (Koenig et al., 2006). According to him developing country's condition on domestic violence against women has raised a lot of concern. This is because developing countries, women are susceptible to domestic violence than their male counterparts. However, Koenig et al. (2006) highlighted that higher social economic status and higher levels of education act as protective factors for women against domestic violence. Other factors will include higher dowry prizes that raise the status of the woman, hence creating woman empowerment and reduce domestic violence. Woman access to resources enable a modern woman to access group based savings and credit facilities that enable women to be financially independent. This leads to women empowerment hence suffocating the risk of violence (Koenig et al., 2006). He found that there exists intergenerational transmission of violence. This applies to people who witnessed

their parents fight as they were growing up. They thus grow knowing that misunderstandings are only solvable through violence. Alcohol and drug abuse have also been reported as a prominent cause of domestic violence. This is because any individual under the influence of drugs and alcohol is difficult to reason with.

Kaufman et al. (2012) carried out a research on sex, race and geographic location in relation to school related student homicides. The study accessed the significant place of sex, race/ethnicity, and geographic location of cases of school-associated student homicide from a sample size of 125 cases (Kaufman et al., 2012). The research found out that urban areas where high poverty and male on male violence was prevalent had the highest incidences. Male against female victims incidences were highly committed in rural areas. White's offenders often involved more than one victim with the majority being female while their black and Latino counterparts often involved single victims of the same sex (Kaufman et al., 2012). These variations in the observation could advise on the prevalence of domestic violence based on sex, race, and geographical region.

2.5 Domestic Violence and Gender

Aizer (2010) presented a research paper on gender wage gap and domestic violence. This was after an estimate that domestic partners commit 75% of the reported cases of violence against women in America. Aizer (2010) noted that there exists a gender wage gap between male dominated and female dominated industries. However, the wage gap has been decreasing with an increased demand for female labor in service industries, thus having a positive impact against violence towards women. By use of an economic theory of household bargaining, Aizer (2010) was able to identify that financial empowerment increases women's bargaining power and hence reduces the level of violence. This is because women with fewer resources are less likely to exit an abusive marriage, especially when there are children in the marriage. It is estimated that reduced wage gap accounts for 9% decrease in domestic violence reported in America between 1990 and 2003 (Aizer, 2010). Although the estimate is based on potential wage and not absolute wage, comparative labor market situations for women should be considered in the analysis of such case. The labor market should be conducive for women to be able to reduce domestic violence against all women, regardless of whether the woman is working or not. Reduction of violence increases the woman's productivity both economically and socially.

Klevens et al. (2012) investigated the relationship between successive acts of violence from partners. The aggressive behavior that is associated with consistent violence incidences was considered if cause of violence was to be discovered. According to Klevens et al. (2012), actions against prevention of violence should be based on the knowledge of the prevalence of partner violence, child mistreatment and community violence. This is because; violence can be from a stranger, but a member of the community, close friends, intimate partners, and children from their elders or friends. From a sample of 3024 respondents in the United States, more than 30% agreed to have engaged in violence with several victims. These victims included partners, friends, acquaintances, and children. All these are members of a community that need to be considered in terms of its setting and what causes the violence.

Iliyasu et al. (2012) investigated the frequency and risks involved in domestic violence among pregnant women. Using a sample of 400 women from Northern Nigeria, Iliyasu et al. (2012) investigated the possibility of domestic violence during pregnancy. The victims reported that financial and domestic issues triggered domestic violence. The risk factors for the eruption of violence between partners were education attainment, age, and marital status. Other factors included drug abuse and alcohol influence. However, highly educated and those in employment reported less violence which indicate that socioeconomic status was key in reducing violence.

2.6 Summary of the Literature Review

The aforementioned studies have highlighted several determinants of domestic violence. Among them is socioeconomic status like education, occupation, income level and the wage gap. The sociocultural determinants include wife beating culture, dowry status, and society view on gender. Demographic factors included age, gender of the victim, marital status, and race. Other factors as identified from research are intergenerational effect, drugs, substance and alcohol abuse and planned revenge after an attack. The next chapter will shall model these factors using logistic regression.

CHAPTER 3: METHODOLOGY

This chapter will focus on the research design used for the project, how the factors will be modeled and the statistical model to be used.

3.1 Data

The data used for this project was collected from Kenya Demographic and Health Survey (KDHS, 2008). This project thus adopted KDHS research design. The sample consisted of 8,444 women aged 15 to 49 and 3465 men aged 15 to 54 selected from 400 clusters throughout Kenya. The method was used to gather data that will assist in monitoring the health condition in Kenya. The survey collected data on a wind range of subjects including, health, household characteristics, demography, educational attainment and economic activities of household members, family planning methods and consumption and expenditures on food and non-food items.

In addition, there was a special feature of this survey that dealt with domestic violence within the household. Due to the very sensitive nature of this issue, it is often difficult to conduct comprehensive research on domestic violence. The difficulties associated with collecting data on domestic violence cannot be overstated. The women were asked a wider range of questions regarding marriage, resources brought at marriage, participation in household income-expenditure activities, marriage arrangement, and their experiences of different types of domestic violence. In particular the target population for this study was all women who have ever been married, selected, and interviewed. In total, they were 4906 women.

3.2 Variables in the Model

This study used the identified variables related to community setting from literature review and also captured by the available data. Among the variables considered were education level of both the woman and the spouse, occupation of both the woman and the spouse, income level of both the woman and the spouse, and wage gap. In addition to this were: wife beating is justified, age, gender of the victim, marital status, ethnicity, intergenerational effect, alcohol abuse, religion, region of stay, husband living in the house, marriage arrangement, wife rank number, access to

media, literacy level, wealth index, who makes financial decision, and effect of the use of contraceptives.

The decision on whether the respondent experience violence or not was dependent on the answers to at least six of the following questions (KDHS, 2008) as listed below.

Does/did your (last) husband/partner ever:

a) Push you, shake you, or throw something at you?
b) Slap you?
c) Twist your arm or pull your hair?
d) Punch you with his fist or with something that could hurt you?
e) Kick you or drag you or beat you up?
f) Try to choke you, or burn you on purpose?
g) Threaten or attack you with a knife, gun, or any other weapon?
h) Physically force you to have sexual intercourse even when you did not want to?
i) Force you to perform any sexual acts you did not want to?
j) Say or do something to humiliate you in front of others?
k) Threaten to hurt or harm you or someone close to you?
l) Insult you or make you feel bad about yourself?

If six or more of the answers are in the affirmative, then the respondent was categorized as having experienced domestic violence, otherwise the respondent was categorized as having not experienced domestic violence.

The variables were:

Dependent Variable (Y) Experience of violence categorized into yes or no.

Independent Variables:

Age of woman ($\mathbf{X_1}$) −This is the age of the respondent. It was taken as discrete data measured in years as at the time of interview.

Age of spouse ($\mathbf{X_3}$) −This is the age of the respondent spouse. It was taken as discrete data measured in years as at the time of interview.

Region of stay (X_3) −This is nominal categorical data. It is based on residence in either of the following regions in Kenya; Nairobi, Central, Coast, Eastern, Nyanza, Rift valley, Western, and Northeastern. Nairobi region is taken as the reference.

Religion (X_4) −This is a nominal categorical data. It is based on the respondent's religion. Five categories were considered, namely; Roman Catholic, Protestant, Muslim, No religion, others (any other religion apart from the four).Roman Catholic is taken as the reference category.

Ethnicity (X_5) −This is a nominal categorical data. It's based on twelve categories Namely; Embu, Meru, Kalenjin, Kikuyu, Kisii, Luhya, Luo, Masai, Mijikenda, Somali, Taita and Others (any other ethnic group not in the category above).The Embu ethnic group was taken as the reference.

Current marital status (X_6) −A categorical data based on the following categories; never married, married, living together, windowed, divorced, and not living together. Never married is taken as the reference category

Husband living in the house (X_7) −A binary data, Living with her or staying elsewhere. Husband living with respondent was taken as the reference.

Number of other wives (X_8) −A categorical data based on the number of co-wives the respondent has. No other was taken as the reference category.

Wife rank number (X_9) − An ordinal categorical data with the following categories;
No.1,2,3,4,5,6, and Don't know. Wife rank no1 was taken as the reference.

Education level of the woman (X_{10}) −An ordinal categorical data, categorized as; no education, primary, secondary and higher education. No education was taken as the reference category.

Education level of the spouse (X_{11}) −An ordinal categorical data, categorized as; no education, primary, secondary and higher education. No education was taken as the reference category.

Occupation of the spouse (X_{12}) −A categorical data based on different occupations. Not currently working was taken as the reference.

Occupation of the respondent (X_{13}) −A categorical data based on different occupations. Not working was taken as the reference.

Type of earnings for work (X_{14}) −This was a nominal data based on whether earnings are by; not paid, cash, cash and kind, kind only or others. Not paid was taken as the reference category.

Earns more than a partner (X_{15}) −This is an ordinal data based on whether the respondent; earns more than, less than, equal to, doesn't bring money home, or don't know. Earning more than the spouse was taken as the reference.

Access to media (X_{16}) −A nominal data categorized as; No, Yes, and Not dejure resident. No access to the media was taken as the reference.

Literacy level of the woman (X_{17}) −An ordinal data categorized as; can't read at all, able to read only parts of a sentence, able to read the whole sentence, no card with required language, or visually impaired. Can't read at all was taken as the reference category.

Wealth index (X_{18}) −An Ordinal data based on; poorest, poor, middle, rich, richest. Poorest was taken as the reference category.

Final say on what to do with money the household earns (X_{19}) −A categorical data based on; Respondent alone, respondent's husband, respondent and other persons, husband alone, someone else, and others. Respondent alone was taken as the reference.

Husband knows that respondent is using contraception (X_{20}) −A Categorical data based on; yes, no or don't know. Yes was taken as the reference category.

Wife beating justified (society view on gender) (X_{21}) −A Categorical data based on no, yes, or don't know. No was taken as the reference.

Husband accuses her of unfaithfulness (X_{22}) −A Categorical data based on; no, yes, or don't know. No was taken as the reference.

Partner drinks alcohol (X_{23}) −A Categorical data base on yes or no. Yes was taken as the reference.

Did her father ever beat her mother (X_{24}) −A categorical data based on; no, yes, and don't know. No was taken as the reference.

3.3 Logistic Regression Models

Logistic regression is a method of modeling the dependence of a binary response variable which takes values 1 and 0. Logistic regression gives each predictor a coefficient which measures its independent contribution to variation in the dependent variable

Model Assumptions:

(i) The independent variable need not be normally distributed. It works better where the group sizes are very unequal.

(ii) Logistic regression does not assume a linear relationship between the dependent and independent variable, but a linear relationship between the logit of the response and explanatory variables.

(iii) The error term is independent and there is no assumption of a normal distribution.

(iv) Independent variables don't have strong co-linearity. Mathematically the resulting models are easier to interpret due to its mathematical simplicity.

The dependent variable Y takes the value 1 if the response is 'yes' and takes a value 0 if the response is 'no'.

Let p=P(Y=1) then 1-p=P(Y=0) and the logistic regression model is defined as

$$ln\left(\frac{p}{1-p}\right) = \beta_0 + \sum_{j=1}^{k} \beta_j x_j \quad (3.1)$$

Where β_0 is the intercept and β_j is the regression coefficient of the j^{th} predictor, j= 1, 2,..,k.

Equation (3.1) can be equivalently expressed as

$$p = \frac{\exp\left(\beta_0 + \sum_{j=1}^{k} \beta_j x_j\right)}{1 + \exp\left(\beta_0 + \sum_{j=1}^{k} \beta_j x_j\right)} \quad (3.2)$$

The regression coefficients indicate the degree of association between each independent variable and the outcome. Each coefficient represents the amount of change we would expect in the response variable if there was a one unit change in the predictor variable.

The goal of logistic regression is to correctly predict the category of outcome for individual cases using the best model. To accomplish this goal a model is created that include all predictor variables that are useful in predicting the response variable.

Logistic regression calculates the probability of success over probability of failure. The results of the analysis are in the form of an odds ratio.

$$\frac{p}{1-p} = \exp\left(\beta_0 + \sum_{j=1}^{k} \beta_j x_j\right) \quad (3.3)$$

The odds ratio is a measure of effect size, describing the strength of association or non-independence between two binary data values. It treats the two variables being compared symmetrically and can be estimated using some type of non-random samples. It is used as a descriptive statistic, and plays an important role in logistic regression.

Hypothesis testing in logistic regression involves reasoning by contradiction. The null hypothesis is that, the predictor coefficient is zero in the population. Hypothesis test tells whether there is sufficient evidence in the sample data to reject the null hypothesis and therefore to accept the alternative hypothesis that the predictor variable coefficient differ from zero.

Each independent variable is tested for its statistical significance. The associated odds ratio (OR) for the significant independent variable is computed as

$$(OR)_j = \exp(\widehat{\beta_j}) \quad (3.4)$$

Where $\widehat{\beta_j}$ is the parameter estimate of the regression coefficient β_j.

Odds ratio whose confidence limits exclude 1 are statistically significant or equivalently regression coefficient estimates whose confidence limits exclude 0 are statistically significant.

Logistic regression calculates changes in the log odds of the dependent variable. For a dichotomous dependent variable, the odds of membership of one group are equal to the probability of membership in the group divided by the probability of membership in the other

group. Odds value can range from zero to infinity and tell you how much more likely it is that an observation is a member of the group rather than a member of the other group.

Odds ratio (OR), estimates the changes in the odds of membership in the target group for a one unit increase in the predictor. For example, if we are predicting whether one is likely to experience domestic violence by a predictor with $\widehat{\beta_J}$=3.2.Thus the odds ratio is exp (3.2) =24.53.The odds of experiencing domestic violence are 24.53 times greater when the predictor increases by one unit. Statistical software calculates this value of the ln(odds ratio) and present it as Exp(β) in the results printout.

3.4 Estimating the Model Parameters

In this section we shall discuss how model parameters are estimated using the method of maximum likelihood and assessment of the fitted model using a Wald χ^2 statistic and the likelihood ratio test. The likelihood for a given model is interpreted as the joint probability of the observed outcomes expressed as a function of the chosen regression model (Dietz et al., 2005). The model coefficients are unknown quantities and are estimated by maximizing their probabilities. It is useful when investigating the contribution of more than one predictor, or for predictors with multiple levels. According to Shakhawat et al. (2012) the likelihood function for estimating $\underline{\beta} = (\beta_0, \beta_1, \beta_2, \beta_3, \dots, \beta_k)'$ is

$$\mathrm{L}\ (\underline{\beta}) = \prod_{i=1}^{n} p^{y_i}\ (1-p)^{1-y_i} \tag{3.5}$$

Where p is given by equation (3.2) and thus (3.5) becomes

$$\mathrm{L}\ (\underline{\beta}) = \prod_{i=1}^{n} \left(\frac{exp\left(\beta_0+\sum_{j=0}^{k} x_{ij}\beta_j\right)}{1+exp\left(\beta_0+\sum_{j=0}^{k} x_{ij}\beta_j\right)}\right)^{y_i} \left(\frac{1}{1+exp\left(\beta_0+\sum_{j=0}^{k} x_{ij}\beta_j\right)}\right)^{1-y_i}$$

$$= \prod_{i=1}^{n} \frac{\left(exp\left(\beta_0+\sum_{j=0}^{k} x_{ij}\beta_j\right)\right)^{y_i}}{1+exp\left(\beta_0+\sum_{j=0}^{k} x_{ij}\beta_j\right)} \tag{3.6}$$

The maximization process to estimate the coefficients is further accomplished by getting the log of the likelihood function L($\underline{\beta}$). The advantage of maximizing the log-likelihood function $l(\underline{\beta})$ over the likelihood function is that the log-likelihood function is in a sum function while the likelihood is a product function. Thus the log likelihood function is

$$l(\underline{\beta}) = \sum_{i=1}^{n}\left(\beta_0 + \sum_{j=1}^{k}\beta_j x_{ij}\right)y_i - \sum_{i=1}^{n} log\left(1 + exp\left(\beta_0 + \sum_{j=1}^{k}\beta_j x_{ij}\right)\right) \quad (3.7)$$

The maximum likelihood equations for estimating $\underline{\beta}$ are;

$$\frac{\partial l(\underline{\beta})}{\partial \beta_0} = \sum_{i=1}^{n} y_i - \sum_{i=1}^{n} \frac{exp\left(\beta_0 + \sum_{j=1}^{k}\beta_j x_{ij}\right)}{1 + exp\left(\beta_0 + \sum_{j=1}^{k}\beta_j x_{ij}\right)} = 0$$

$$\frac{\partial l(\underline{\beta})}{\partial \beta_j} = \sum_{i=1}^{n} y_i x_{ij} - \sum_{i=1}^{n} x_{ij} \frac{exp\left(\beta_0 + \sum_{j=1}^{k}\beta_j x_{ij}\right)}{1 + exp\left(\beta_0 + \sum_{j=1}^{k}\beta_j x_{ij}\right)} = 0 , \qquad j=1,2,\ldots,k \quad (3.8)$$

These equations are nonlinear and require an iterative solution which is readily handled by statistical software.

The maximization process of determining the coefficients estimates are accomplished by finding the first and second derivative of the log-likelihood function and checking if the derivative is less than 0 for a maximum.

3.5 Assessment of the Fitted Model

After estimating the regression coefficients, it is necessary to assess the appropriateness, adequacy, and usefulness of the model. First the importance of each of the explanatory variables is assessed by carrying out Wald χ^2 statistic or a likelihood ratio test. The overall goodness of fit of the model is then tested.

3.5.1 The Wald Statistic

Wald χ^2 statistic is used to test the significance of the individual regression coefficients in the model. It is calculated as

$$\left(\frac{\widehat{\beta_j}}{Se(\widehat{\beta_j})}\right)^2, \quad j=1,2,\ldots,k \quad (3.9)$$

Each Wald χ^2 statistic is compared to a χ^2 distribution with 1 degree of freedom. This method reliability is questionable, particularly for small samples. Likelihood ratio tests are considered superior.

3.5.2 Likelihood Ratio Test

This test for a particular parameter compares the likelihood of obtaining the data when the parameter is zero (L_0) with the likelihood (L_1) of obtaining the data evaluated at the maximum likelihood estimate of the parameter. The test statistic is calculated as

$$-2\ln\left(\frac{L_0}{L_1}\right) \qquad 3.10$$

It is compared with a χ^2 distribution with 1 degree of freedom. It indicates whether the parameter contributes significantly in predicting the dependent variable.

3.6 Overall Goodness of Fit of the Model (M)

This measures how well the model describes the response variable. Assessing goodness of fit involves investigating how the values predicted by the model are close to the observed values.

3.6.1 Hosmer-Lemeshow Test

Hosmer-Lemeshow test is commonly used for assessing goodness of fit of a model and allow for any number of explanatory variables which may be continuous or categorical. The observations are partitioned into groups of approximately equal sizes. The observations are grouped into deciles based on predicted probabilities. The test statistic is calculated using the observed and expected counts for the categories as

$$\sum \frac{(observed-expected)^2}{expected} \sim \chi^2(8) \qquad (3.11)$$

3.6.2 R^2 for Logistic Regression

Most statistical packages provide further statistics that are used to measure the usefulness of the model and that are similar to the coefficient of determination (R^2) in linear regression. The Cox and Snell and the Nagelkerke R^2 are two such statistics. If there are n observations in the dataset sample then the conditional probability L(M) of the dependent variable given the independent variable is the product of n such probabilities. The n^{th} root of the product L(M) provides an estimate of the likelihood of each dependent value. Cox and Snell present the R^2 as a transformation of the statistic that is used to determine the convergence of a logistic regression. A likelihood of value 1 indicates that the full model predicts the outcome perfectly.

$$-2ln\left(\frac{L(M_{Intercept})}{L(M_{full})}\right) \tag{3.12}$$

Cox and Snell is then $1 - L(M_{intercept})^{\frac{2}{n}}$ which is less than 1. It is expressed as;

$$R^2 = 1 - \left\{\frac{L(M_{intercept})}{L(M_{full})}\right\}^{\frac{2}{n}} \tag{3.13}$$

Nagelkerke R^2 is obtained by dividing Cox and Snell by its maximum possible value

$$R^2 = \frac{1-\left\{\frac{L(M_{intercept})}{L(M_{full})}\right\}^{\frac{2}{n}}}{1-L(M_{intercept})^{\frac{2}{n}}} \tag{3.14}$$

The R^2 statistics indicates how useful the explanatory variables are in predicting the response variable.

3.7 Stepwise Regression and Analysis Software

The method for including variables in the model was done in a stepwise manner going forward, testing for significance of the inclusion of the variable at every stage. The tests are based on the change in likelihood resulting from including the variable. The process of adding more variables stopped when all of the variables available have been included or when it is not possible to make a statistically significant reduction in -2log-likelihood (that is,-2$l(\underline{\beta})$) using any of the variables not yet included. All the identified variables given above were subjected to step wise regression using STATA.

CHAPTER 4: DATA ANALYSIS AND RESULTS

4.1Descriptive Analysis

Table 4.1: Overall Data Frequency Table

	Frequency	Percent	Valid percent	Cumulative percent
No	3151	64.2	64.2	64.2
Yes	1748	35.6	35.6	99.9
Missing	7	0.1	0.1	100.0
Total	4906	100.0	100.0	

Table 4.1 indicates the frequency of those who reported a' yes' and' no' to domestic violence. Few cases of 'yes' to domestic violence was reported as compared to the 'no' response.The missing values were not considered for further analysis. This reduced the sample population to 4899.

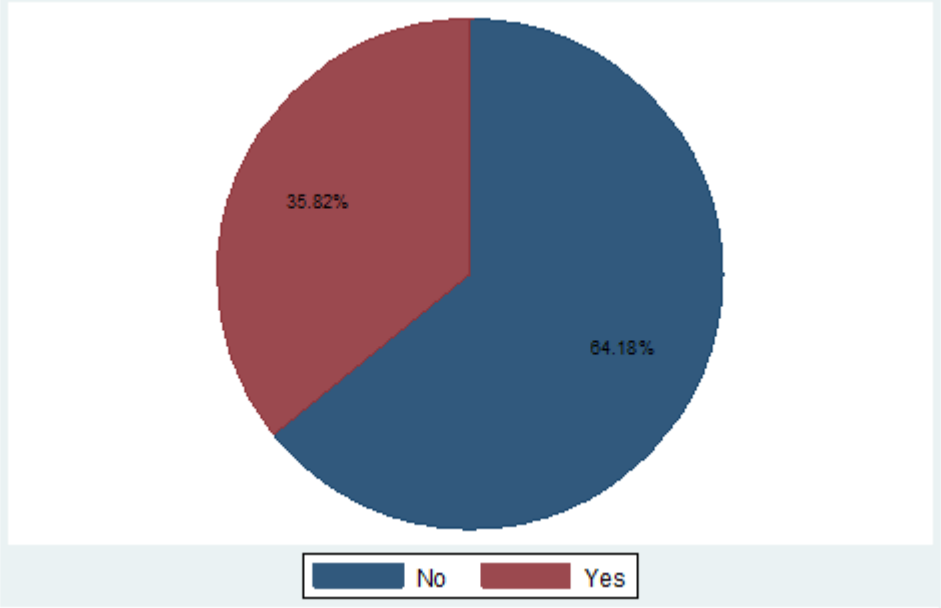

Figure 4.1: Pie Chart on Women response variable.

The percentage of women who reported having experienced domestic violence is 35.88% compared to 64.12% who reported no violence (Figure 4.1). These results indicate that domestic violence in Kenya is far below average but there is still much to be done to attain a zero percent violence.

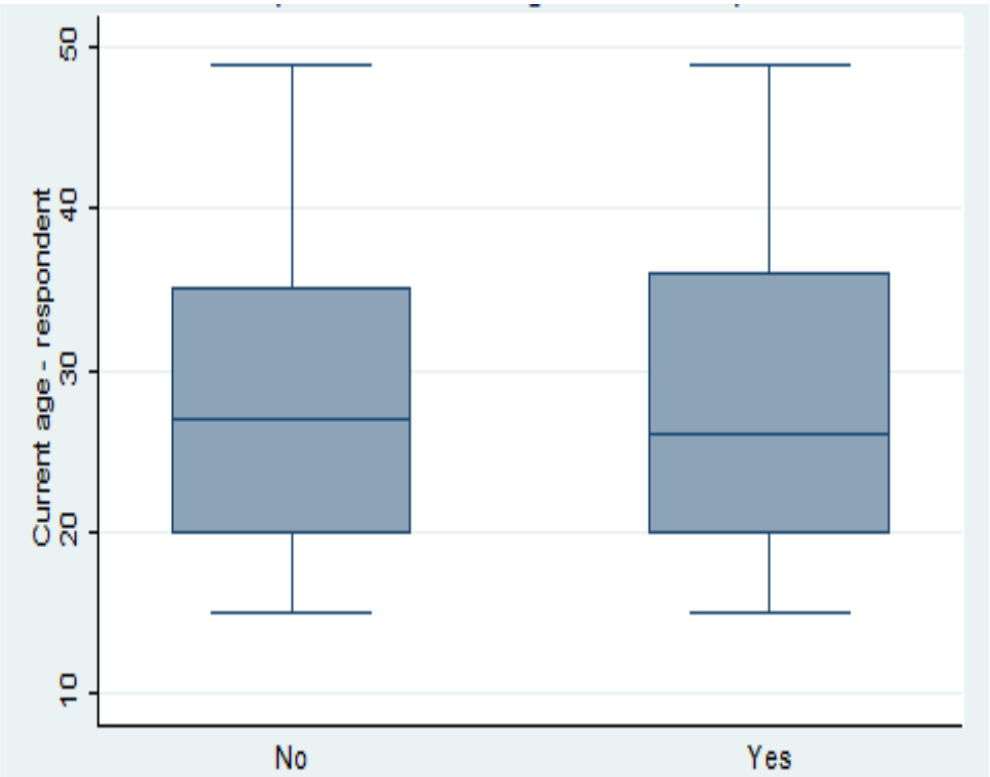

Figure 4.2: Box Plot of the Current Age of the Respondents

From Figure 4.2 the mean age of respondents who experienced domestic violence is lower than that of those who returned a no to violence response. This could be attributed to lack of tolerance and personal adjustments for the young couples. Early marriages could also explain as very young women can easily be taken advantage of as they are limited in knowledge and exit options and their husbands know it.

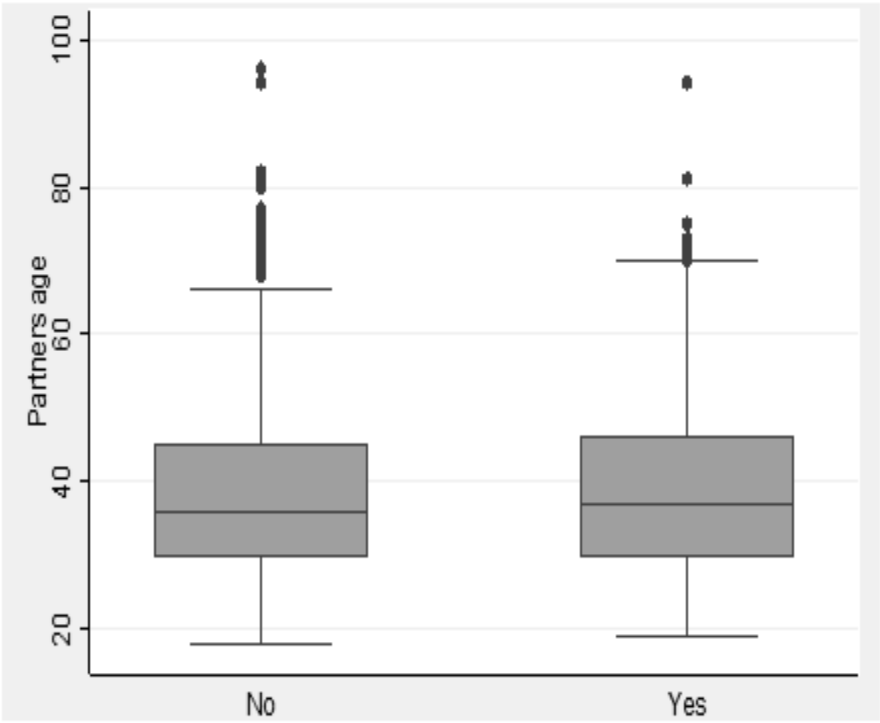

Figure 4.3: Box Plot of The Partner's Age

Figure 4.3 shows that the average age of men who propagate domestic violence is higher than those who don't. As discussed earlier these men could be in their second marriage with a much younger spouse who is vulnerable to abuse.

The following tables show how domestic violence incidences compare within the factors already identified.

Table 4.2: DomesticViolence with Region

	Nairobi	Central	Coast	Eastern	Nyanza	R/Valley	N.Eastern	Western
NO	351	394	513	473	382	451	278	309
%	78.5	67.2	76.4	70.4	48.3	61.2	66.3	53.8
YES	96	193	158	199	408	287	141	266
%	31.5	32.8	33.6	29.6	51.7	38.8	33.7	46.2
TOTAL	447	587	671	672	790	738	419	575
%	9.12	11.98	13.70	13.72	16.13	15.06	8.55	11.74

From Table 4.2, Nyanza region posted the

highest percentage of domestic violence followed by western with all the other regions posting almost similar results.

Table 4.3: Domestic Violence with Religion

	RomanCatholic	Protestants	Muslims	No Religion	Others
NO	554	1849	628	75	5
%	59.6	63.7	69.8	57.2	83.4
YES	375	1051	260	56	1
%	40.3	36.3	29.2	42.8	16.6
TOTAL	929	2900	888	131	6
%	18.96	59.20	18.13	2.67	0.12

Women from other religions have the lowest risk of domestic violence with 83% reporting 'no' to violence (Table 4.3). Roman Catholic faithful and those without any religion led in incidents if domestic violence.

Table 4.4:Domestic Violence with Ethnicity

	Embu	Kalenjin	Kamba	Kikuyu	Kisii	Luyia	Luo	Masai	Meru	Mijikenda	Somalia	Taita	Others
NO	57	277	272	586	147	384	325	43	169	300	306	215	2
%	67.8	69.6	73.1	70	55	56.5	50.3	51	77	72.7	67.2	68	50
Yes	27	121	100	260	118	296	321	41	50	113	149	114	2
%	32.2	30.4	26.9	30	45	43.5	49.7	49	33	27.3	32.8	32	50
T	84	398	372	846	265	680	646	84	219	413	455	359	4
%	1.71	8.12	7.59	17.27	5.4	13.8	13.2	1.7	4.4	8.43	9.29	7.3	0.04

The Luo ethnic group reported highest percentage of violence against women the lowest being Kamba ethnic group (Table 4.4).

Table 4. 5: Domestic Violence with Current Marital Status

	Married	Living together	Windowed	Divorced	Not living together
NO	2634	209	161	37	110
%	66.6	66.3	59.4	39	41
YES	1316	106	110	58	158
%	33.4	33.7	40.6	61	59
TOTAL	3950	315	271	95	268
%	86.63	6.43	5.53	1.94	5.47

The highest percentage of those who reported domestic violence is from the respondents who are divorced and not living together. Those who are married and those living together have the lowest risk of domestic violence (Table 4.5).

Table 4.6: Domestic Violence with Wife Rank Number

	1	2	3	4	6	D.K	Missing
NO	88	193	34	10	2	39	2785
%	39.8	53.1	69.3	83.4	50	60.9	66.55
YES	133	171	15	2	2	25	1400
%	59.2	46.9	30.7	16.6	50	39.1	33.45
TOTAL	221	364	49	12	4	64	4185
%	4.51	7.43	1.00	0.24	0.08	1.31	85.43

As wife rank number increases, the risk of domestic violence decreases (Table 4.6). The high numbers of missing values indicate that most respondents were unwilling to respond to this question.

Table 4.7: Domestic Violence with Educational Level of Woman

	No education	Primary	Secondary	Higher
NO	568	1590	711	282
%	60.6	60.1	72.7	82.9
YES	368	1054	268	58
%	39.4	39.9	27.3	17.1
TOTAL	936	2644	979	340
%	19.11	53.97	19.93	6.94

The risk of experiencing domestic violence decreases as one acquires higher education (Table 4.7).

Table 4.8: Domestic Violence with Type of Earnings

	Not paid	Cash only	Cash&Kind	Kind only	D.K	Missing
NO	387	1331	138	30	2	1263
%	57.9	64.8	43.9	62.5	100	69.7
YES	281	724	176	18	0	549
%	42.1	35.2	56.1	37.5	0.00	30.3
TOTAL	668	2055	314	48	2	1812
%	13.64	41.95	6.41	0.98	0.04	36.99

Table 4.8 indicates the highest proportion of women work for cash only. This group reported the lowest percentage of domestic violence.

Table 4.9: Domestic Violence with Literacy Level of Woman

	Can't read	Able to read only part of sentence	Able to read whole sentence	No card with required language	Visually impaired	Missing
NO	730	358	2042	10	8	3
%	59.4	57.8	67.9	35.8	61.5	37.5
YES	498	261	961	18	5	5
%	40.6	42.2	32.1	64.2	38.5	62.5
TOTAL	1228	619	3003	28	13	8
%	25.07	12.64	61.3	0.57	0.27	0.16

Table 4.9 indicates that the lowest risk to domestic violence is with women who can be able to read the whole sentence and those who are visually impaired.

Table 4.10: Domestic Violence with Wealth Index

	Poorest	Poor	Middle	Rich	Richest
NO	638	444	518	602	949
%	56.8	66.6	62.4	66.4	74.4
YES	484	323	311	305	325
%	43.2	33.4	37.6	33.6	25.6
TOTAL	1122	967	829	907	1274
%	22.9	15.66	16.92	18.51	26.01

Table 4.10 shows that the risk to domestic violence decreases with improvement in economic status of the family.

Table 4.11: Domestic Violence with Partner Drinks Alcohol

	YES(Drinks alcohol)	NO(Doesn't drink alcohol)
NO	2239	912
%	70.3	53.2
YES	943	804
%	29.7	46.8
TOTAL	3182	1716
%	64.95	35.03

Women who are married to partners who drink alcohol are at a lower risk of domestic violence than those who are married to men who drink (Table 4.11).

Table 12: Domestic Violence with Father Ever Beat Her Mother

	No	Yes	Don't know
NO	1986	876	289
%	73.5	50.3	63.9
YES	716	867	163
%	26.5	49.7	26.1
TOTAL	2702	1743	452
%	55.15	35.58	9.23

Women whose fathers did not beat their mothers have the lowest risk of experiencing domestic violence (Table 4.12). This shows there is a possibility of an intergenerational culture of violence in a community.

4.2 Logistic Regression

A chi square test was done to assess if there is a relationship between experiencing domestic violence and the various identified variables. The hypotheses to be tested were:

H_0-There exists no relationship between domestic violence and the various identified variables.

H_1-There exists a relationship between domestic violence and the various identified variables.

The output for the test is as shown in the Table 4.13:

Table 4.13: Chi-Square Output

Variable	Chi square	Likelihood Ratio	Degree of freedom	P-value
X_3	214.9	216.6	7	0.0000
X_4	40.77	43.53	5	0.0000
X_5	170.76	175.07	13	0.0000
X_6	102.93	98.13	4	0.0000
X_7	82.87	80.46	3	0.0000
X_8	176.42	172.58	8	0.0000
X_9	90.21	86.66	6	0.0000
X_{10}	106.35	113.63	3	0.0000
X_{11}	109.22	116.58	4	0.0000
X_{12}	135.29	158.99	58	0.0000
X_{13}	140.07	155.01	48	0.0000
X_{14}	92.87	90.94	5	0.0000
X_{15}	10.17	11.10	6	0.1180
X_{16}	2.333	2.35	1	0.1270
X_{17}	54.29	53.40	5	0.0000
X_{18}	101.31	103.40	4	0.0000
X_{19}	28.72	29.43	5	0.0000
X_{20}	55.27	55.48	4	0.0000
X_{21}	2.333	2.35	1	0.1270
X_{22}	437.93	434.09	3	0.0000
X_{23}	145.8	144.21	2	0.0000
X_{24}	253.05	252.05	3	0.0000

At 5% level of significance the following variables are statistically insignificant: $X_{15,}$ X_{16} and $X_{21.}$ The chi square values of the remaining variables make the null hypothesis to be rejected and the alternative hypothesis to be adopted (Table 4.13). The inference is that there exists a

significant relationship between domestic violence and the nineteen variables indicated in the table.

The variables were subjected to logistic regression using statistical software STATA and the output is as shown in the table below

Table 4.14: Logistic Regression Output

	B	S.E	Z	P>IzI	95% C.I		EXP(B)
X_3	0.1129	0.0179	6.28	0.000	0.0776	-0.1481	1.1195
X_4	-0.0125	0.0051	-2.42	0.016	-0.0226	-0.0023	0.9875
X_5	0.0052	0.0014	3.62	0.000	0.0024	0.0081	1.0052
X_6	0.3357	0.0741	4.53	0.000	0.1903	0.4811	1.3989
X_9	-0.0060	0.0009	-6.07	0.000	-0.0079	-0.0040	0.9940
X_{10}	-0.2756	0.0629	-4.38	0.000	-0.3990	-0.1523	0.7591
X_{14}	-0.0056	0.0010	-5.36	0.000	-0.0077	-0.0035	0.9941
X_{17}	0.1250	0.0438	2.85	0.004	0.0391	0.2109	1.1331
X_{18}	-0.0998	0.0271	-3.68	0.000	-0.1530	-0.0466	0.9544
X_{23}	0.8039	0.0675	11.9	0.000	0.6715	0.9364	2.2342
X_{24}	0.0360	0.0139	2.57	0.010	0.0085	0.0634	1.036
CONSTANT	-0.5592	0.2858	-1.95	0.05	-1.1194	0.0009	

Table 4.14 shows that out of the eighteen identified variables only eleven variables were significant in explaining whether one is at a risk of experiencing domestic violence or not. The confidence intervals for all the variables show that the odds ratios are statistically significant.

The model below resulted from the output above:

$$\ln\left(\frac{p}{1-p}\right) = -0.5592 \pm 0.2858 + (0.1129 \pm 0.179)x_3 + (-0.0125 \pm 0.0051)x_4 + (0.0052 \pm 0.0014)x_5 + (0.3357 \pm 0.0741)x_6 + (-0.00603 \pm 0.0009)x_9 + (-0.2756 \pm 0.0629)x_{10} + (-0.0065 \pm 0.001)x_{14} + (0.125 \pm 0.0438)x_{17} + (-0.0998 \pm 0.0271)x_{18} + (0.8039 \pm 0.0675)x_{23} + (0.0360 \pm 0.0139)x_{24} \quad (4.1)$$

The model indicates that out of the many variables identified as possible determinants of domestic violence only eleven were statistically significant. They include; region of resident, religion, ethnicity, marital status, wife rank number, woman's education level, type of earnings for work, literacy level of the woman, wealth index, partner drinking alcohol, and whether her father ever beat her mother.

Table 4.15:Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
4	864.777	.034	.046

Table 4.15 shows that the values of Cox and Snell and Nagelkerke R^2 values indicate that the model is useful in predicting determinants of domestic violence.

Table 4.16: Hosmer-Lemeshow Test

Step	Chi-square	Df	Sig.
4	16.251	8	.059

Hosmer-Lemeshow test results indicates that the number of women who experienced domestic violence are not statistically different from those predicted by the model and hence the overall model is of good fit (Table 4.16).

4.2.1 Interpreting Model Parameters

The model shows that holding the other entire ten factors constant a woman who resides outside Nairobi is 11.9% more likely to experience domestic violence than the one living in Nairobi. From the findings of this study it is evident that if you are not a Roman Catholic faithful you are less likely to experience domestic violence. However, this decline is minimal, but statistically significant.

Ethnicity was another factor under consideration in this study Embu ethnic group was taken as the reference category in this analysis. The findings are, holding all the other factors constant, a woman who is not from the Embu ethnic group is 1.0052 times more likely to experience domestic violence.

The current marital status of the respondent was also regressed for domestic violence. This was a nominal categorical variable in which 'never married' was taken as the reference category. As expected, those who are outside this category are 39.8% more likely to experience domestic violence if all the other factors are held constant.

The study revealed that wife rank number in a polygamous union is a factor in determining whether one will experience domestic violence or not. If you are not the first woman in marriage you are less likely to experience domestic violence. Every increase in wife rank reduces the chance of domestic violence by 0.6% holding all the other factors constant.

The model reveals that if all the other factors are held constant , when one has any other education level other than no education her chances of experiencing domestic violence reduces by 25%.

How one is remunerated for the work done was also a factor under consideration in this research. This study considered 'not paid' as the reference category in this categorical variable. From the results, anybody who is not in this category is less likely to experiencing domestic violence. This chance is reduced by 0.5%.

Also under study was the literacy level of the woman. In this category, ‘can’t read’ was taken as the reference category. The odds of experiencing domestic violence if you are not in this category are increased by 13.3%. Economic theory in domestic violence was measured using the wealth index as a variable. The odds of experiencing domestic violence if you are not poorest have decreased by 5% holding all other factors constant.Women married to partners who do not drink alcohol are 23.4% more likely to experience domestic violence than those married to husbands who drink alcohol.

This research study also tested the effect of intergenerational culture of violence in societies. Of interest was to know the effect of witnessing domestic violence and experiencing the same.Thiswas a categorical variable with a ‘yes’ and ‘no’ response. Women who witnessed their father beating their mother are 3.6% more likely to undergo the same.

4.2.2 Discussion

As earlier mentioned in the statement of the problem many researchers keen on identifying determinants of domestic violence have ignored the impact of community settings in Kenya.

Among the various factors identified by this study that are statistically significant as determinants of domestic violence in Kenya, it is easy to draw conclusion that they all have different weights. Odds ratio which is presented as EXP (B) in table 14 will be used to measure the effect of each determinant. The results show that taking of alcohol has the greatest effect in minimizing the risk of domestic violence in Kenya. This is closely followed by the current marital status of the woman.

Among the variables under consideration, membership to a particular ethnic group ranks lowest. A change from the reference ethnic group (Embu) to the others had a corresponding 0.5% increase in the risk of domestic violence. Wealth index as measured during data collection contributed in domestic violence. When a family graduates from the category of ‘poorest’ to any other the risk of experiencing domestic violence decreases. These findings are in agreement with Koenig et al. (2006) who indicated that high social economic status act as a buffer to domestic violence. However his suggestion that alcohol use was a prominent cause of domestic violence is negated by the findings of this paper as discussed earlier. This study also identifies the culture of violence as key in determining the risk of violence. Just like with the findings of Toufique and

Razzaque (2007) it was noted those women who witnessed violence against their mothers were at a higher risk of experiencing the same.

This study has identified region of resident as a determinant of domestic violence in Kenya. From the findings of the researchstudyone is more likely to experience domestic violence if you reside outside Nairobi than when you are in the capital city. This concurs with the findings of Arthur and Clark (2009) when they tested their modernization theory. The findings were the more the people become modern the less the violence. The assumption of this study is Nairobi being the capital city has more modern facilities, infrastructure than the other regions under study.

As expected the model also posted an increase in the chances of experiencing domestic violence if one is married. The reference category was never married and if one is not in this category the chance of experiencing domestic violence is 1.39 times higher. This was expected as the emphasis of this study is on spousal violence.

The Kenyan communities are characterized by monogamy and polygamy marriage settings. In polygamous unions in Kenya the wife rank number is a significant indicator of domestic violence. The wife who comes to the union latest is usually considered a favorite to the husband. This is a widely held belief in our society. Her presence in the marriage makes the husband feel he has several options and any slight provocation from the other wives triggers violence.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This research study has found out that the more the women get educated the less they report domestic violence. In the model above a wife who has some form of formal education is 25% less likely to experience domestic violence than the one with no education at all. This is in agreement with Koenig et al. (2006) who stated that higher social economic status and higher education act as protective factors for women against domestic violence.

Another significant determinant was a mode of payment for work done. Women who are not paid at all for the work they do report more cases of domestic violence than those who are paid. Although the change in odds ratio is not big it is however significant.

This study suggests that those who are responsible for drafting laws to curb domestic violence against women consider the strength of each factor when recommending for penalties. This study also seeks to advise the community on what trigger more to the violence they witness in their homes.

5.2 Recommendations

Logistic regression was used in this study to identify the key determinants of domestic violence in Kenya. Although this was the best model with this kind of dependent variable, I feel there are other regression models that can be used to produce a more accurate output for this study. I strongly recommend other researchers to try this. The data used for this study was provided by female respondents, the feeling was domestic violence is assumed to be violence against a woman. I recommend further study be done with the view that male partners also do experience domestic violence against them.

From the findings of this study it is necessary to recommend further research on why alcohol consumption decreases the risk of domestic violence.

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