# Alcohol Consumption and Healthcare Expenditure in Kenya

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## Abstract

*This study investigates the factors influencing alcohol consumption and the effects of alcohol consumption on healthcare expenditure in Kenya using data from the 2005 Kenya Integrated Household Budget Survey (KIHBS). The analysis made use of the Cragg's double hurdle model, also known as two-part model when applied to cross-sectional data. The model splits the households' decision into two: the participation and the consumption decision. Participation decision is examined in the context of a logistic model, while the consumption decision given the decision to consume is analyzed with a log-linear regression.*

*Descriptive results show that there are differences in alcohol consumption across different regions in Kenya, in terms of the number of households and the total expenditure on alcohol. Estimation results show that the participation and consumption decisions are significantly influenced by social, economic and demographic characteristics. In particular, presence of children, household head being female, and head being married reduces the likelihood of alcohol participation, while increase in age of the household head, tobacco consumption and increase in income increases the likelihood to drink alcohol. However, the increase in age has an inverted u-shape with a point where further increase in age reduces the probability of participation. On the other hand, female headed households, presence of children aged 0-14 years, and increase in household size by a member reduces alcohol expenditure by 30, 20 and 5 per cent, respectively. Households using tobacco spend 15 per cent more on alcohol while an increase in income by 1 per cent increases expenditure on alcohol by 0.73 per cent. Effects of alcohol consumption on healthcare expenditure was indeterminate, since it had different signs in the participation and the consumption decision.*

*The study recommends that alcohol control programmes should target the groups that are more vulnerable, specifically the relatively young heads, mostly male who reside in urban areas and are smokers. There is also need to incorporate gender in alcohol control planning, and develop regional-specific alcohol control campaigns. Twin strategies for goods that are consumed together should be developed.*

## Abbreviations and Acronyms

| | |
|---|---|
| DALYs | Disability Adjusted Life Years |
| GDP | Gross Domestic Product |
| HIV/AIDS | Human Immunodeficiency Virus/Acquired Immuno-Deficiency Syndrome |
| KIHBS | Kenya Integrated Household Budget Survey |
| KNBS | Kenya National Bureau of Statistics |
| NACADA | National Authority for Alcohol and Drug Abuse |
| NCDs | Non-Communicable Diseases |
| OLS | Ordinary Least Squares |
| SSA | Sub-Saharan Africa |
| WHO | World Health Organization |
| YPLL | Years of Potential Life Lost |

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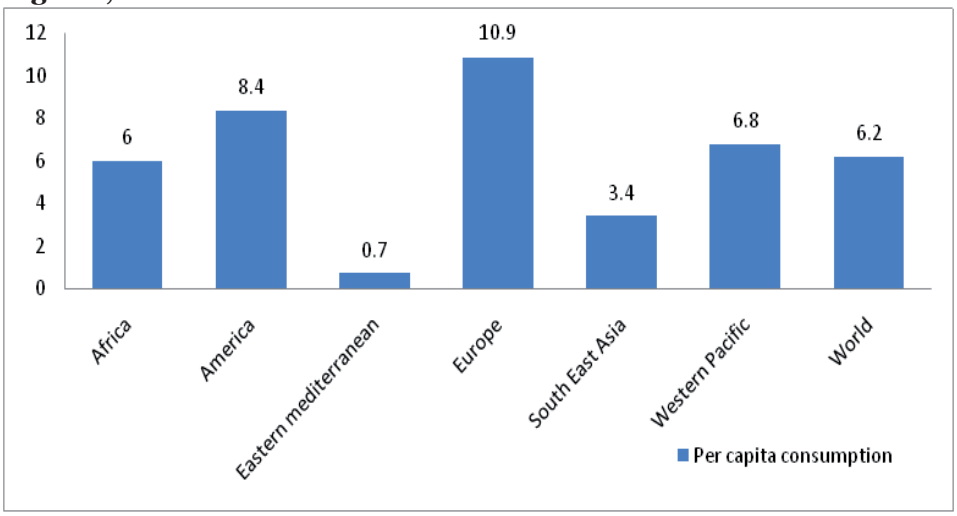
# 1. Introduction

## 1.1 Background

The World Health Organization (WHO) has identified tobacco use, alcohol abuse, physical inactivity and unhealthy diet as key health risk factors that cause most of the non-communicable diseases (WHO, 2010). A report by WHO noted high levels of alcohol consumption, with a global adult per capita consumption of 6.15 litres in 2010. This is the amount in litres of pure alcohol consumed by persons aged 15 years and above (WHO, 2014). Alcohol use varies across the globe, with some regions recording higher consumption than others. In 2010, the European region recorded the highest per capita consumption, while eastern Mediterranean region had the lowest per capita alcohol consumption, which is mainly attributed to Islamic faith. Figure 1.1 shows adult per capita consumption across different regions.

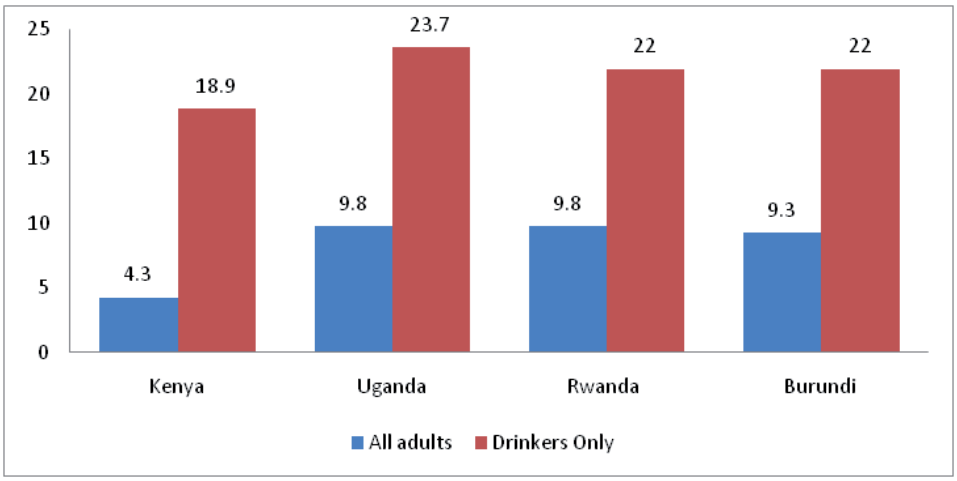
Average per capita alcohol consumption for all persons aged 15 years and above in Africa was 6.0 litres in 2010. In Kenya, it was 4.3 litres per year, which was lower than Tanzania (7.7 litres) and Rwanda and Uganda both at 9.8 litres (WHO, 2014). However, some of the alcohol consumed in Africa goes unrecorded. Marquez and Farrington (2013) noted that 31 per cent of the alcohol consumed in Sub-Saharan Africa (SSA) goes unrecorded, most of which is home-brewed, such that other alcoholic drinks (apart from wine, beer and spirits) such as fermented maize and millet account for 48 per cent of adult per capita consumption. It is estimated that

**Figure 1.1: Adult per capita alcohol consumption across different regions, 2010**




*Source: WHO (2014)*

**Figure 1.2: Adult per capita alcohol consumption, 2010**




*Source: WHO (2014)*

the national prevalence rate of alcohol abuse among Kenyans aged 15-65 years is 13 per cent (Government of Kenya, 2012). The per capita consumption of alcohol among adults aged 15 years and above in selected east African countries is shown in Figure 1.2.

The global average consumption of alcohol among drinkers aged 15 years and above was 17.2 litres by 2010. The African region average was 19.5 litres. However, average consumption of alcohol among drinkers in Kenya was 18.9 litres per year in 2010, lower than Rwanda and Uganda at 22.0 litres and 23.7 litres, respectively (WHO, 2014). It should be noted that even though the average per capita alcohol consumption in Kenya is lower than the global and even East African trends, Kenyans are not any better. This is due to the fact that 18.9 litres translates into 41.2 grammes of pure alcohol per day, which is more than 3 standard drinks daily.

According to WHO, consuming more than two standard drinks per day increases the risk of alcohol-related diseases, and Kenya falls in this category. These statistics allude to the findings of Marquez and Farrington (2013) that though seven out of ten adults in Africa abstain from alcohol, alcohol consumers do it in a risky way, thus the national average may hide the true status of alcohol consumption in African countries.

Globally, alcohol-attributable deaths were 3.3 million (5.9%) in 2012. Further, alcohol use accounted for 5.1 per cent of the global burden of disease and injury. In SSA, alcohol is responsible for 2.2 per cent of all deaths and 2.5 per cent of the total burden of disease and injury (WHO, 2014). Over the period 1990-2010, the number of disability adjusted life years (DALYs) associated with alcohol use in Africa increased by 32 per cent (World Bank, 2013). In SSA, alcohol is responsible

for 2.2 per cent of all deaths and 2.5 per cent of DALYs (Marquez and Farrington, 2013).

World Bank notes that for the period 1990-2010, alcohol use was one of the top drivers of ill health in Burundi and Uganda. The report indicated that reducing alcohol intake in Uganda could reduce the number of DALYs from liver cirrhosis by 79 per cent (World Bank, 2013). Other alcohol-related problems include domestic violence, risky sexual behaviour, lower productivity and petty crimes. A study by Lwanga (2007) showed that 52 per cent of domestic violence cases against women in Uganda were because of alcohol consumption by their male partners. Alcohol is therefore associated with ill-health as well as morbidity.

It is estimated that at least 2.6 per cent of the deaths in Kenya are as a result of alcohol abuse (Government of Kenya, 2012). In 2010, prevalence of alcohol-use disorders in Kenya was 3.1 per cent, while that of alcohol dependence and harmful use of alcohol was 1.4 and 1.9 per cent, respectively (WHO, 2014). Alcohol use is not only expensive, but also a risk factor for non-communicable diseases. It is also associated with accidents, injuries and violence. Non-communicable diseases, injuries and violence-related conditions contribute to a high burden of ill-health and mortality in Kenya (ibid). Some of the diseases associated with alcohol use include: cardiovascular diseases, cancers, neuropsychiatric disorders, liver cirrhosis, maternal and perinatal conditions, among others.

A survey by the National Authority for Campaign Against Alcohol and Drug Abuse (NACADA) showed that 35.7 per cent of all alcohol users in Kenya diverted resources from other domestic goods in order to buy alcohol, while 32 per cent of alcohol users were violent to their spouses or other family members. Additionally, 13 per cent of Kenyans on alcohol or other drugs reported to have had sex with someone other than their regular partner while drunk, and six per cent of children had engaged in sex as a result of alcohol consumption.The study further showed that eight per cent users of all forms of traditional liquor seek medical attention for health problems directly related to alcohol consumption (NACADA, 2012).

Diversion of resources to finance alcohol consumption presents an opportunity cost of financing basic household commodities such as food, education and healthcare. In some cases, expenditure on alcohol is greater than the income, implying that households incur debts to finance alcohol consumption. In all these instances, alcohol consumption may lead to poverty or drive poor households into even greater poverty.

The diseases and injuries/violence related conditions, which are associated with alcohol abuse, have led to an increase in household expenditure on medical care and the overall health burden in Kenya. The risky sexual behaviour among

persons under the influence of alcohol is a major risk for HIV/AIDS transmission, which further increases expenditure on health. Understanding the net effect of alcohol consumption on health and other aspects of the economy would be important in drafting health policies and laws geared towards reducing the burden of disease in the country.

## 1.2 Problem Statement

A lot of research on alcoholism has been carried out globally by various scholars such as Zyaambo *et al.* (2013); Dias, Oliveira and Gracia (2011); Ground and Koch (2007); Aristei *et al.* (2005); Angulo *et al.* (2001); Yen and Jensen (1995); and Blaylock and Blisard (1993), among others. However, studies in Kenya are scanty and some, suh as Marquez and Farrington (2013), focus on East Africa. Lack of empirical studies on alcoholism in Kenya has been an impediment in formulating specific policies for controlling the negative effects of alcohol use in the country.

Alcohol abuse is also associated with road fatalities. It has also been associated with domestic violence, school drop-out and diversion of household income from basic household items to alcohol. Anecdotal evidence shows that alcohol use is the leading cause of impoverishment of households as some alcohol users sell household goods such as utensils to finance consumption. Therefore, there is need to establish the characteristics of alcohol users in Kenya and assess whether the consumption has any effect on their health.

For instance, is it that they have more income at their disposal, hence afford basic goods plus alcohol? Or is it that they divert their spending from basic household goods to alcohol? Is it that households that use alcohol have lower or higher educational attainments? Do all these factors work independently or interact with each other to produce an alcoholic? Does household disease burden increase with alcohol intake (on average)? How manifest is the problem of alcohol consumption in Kenya? Since harmful use of alcohol is a risk factor to health problems, it is important to assess who uses it and whether they consume more medical care due to alcohol use.

The Government of Kenya has made several attempts to control consumption of alcohol, including the enactment of the Alcoholic Drinks Control Act of 2010, popularly known as the Mututho law, which regulates the production, sale and consumption of alcoholic drinks. Despite the efforts made in regulating alcohol consumption in Kenya as well as their effects on households' health status, few attempts have been made to document the factors that lead to increased alcohol consumption by individuals and the effects alcohol has on household income, and consequently on health care expenditure. This study intends to bridge this gap.

## 1.3 Research Questions

The research questions guiding the study include:

(i) What are the factors influencing consumption of alcohol in Kenya?

(ii) What are the effects of alcohol consumption on healthcare expenditure?

## 1.4 Objectives

The main objective of the study is to analyze the factors influencing alcohol consumption and the effects on healthcare expenditure. The specific objectives are:

(i) To examine the social, economic and demographic factors that influence alcohol consumption; and

(ii) To analyze the effect of alcohol consumption on healthcare expenditure.

## 1.5 Justification and Policy Relevance

The study comes in the backdrop of the current alcoblow (breathalyzer) campaign aimed at reducing drunken-driving, with the aim of avoiding road carnage on Kenyan roads. This study is therefore timely given that alcohol consumption has high direct and indirect costs to the individuals and also to the economy at large. The study also comes at the wake of devolution. It would be necessary for the county governments to know the effects of alcohol consumption on the health budgets as well as on poverty, thus strengthen the fight on alcohol abuse at the local level.

There is the need to know who the alcohol users are in terms of their characteristics. Past studies have not empirically tested these factors in the Kenyan context, and therefore this study will update existing information and also generate new knowledge on this area

Alcohol abuse has been linked to a number of diseases and injury-related conditions. However, studies on alcohol use and its effect on health expenditure in Kenya are scanty, yet there is an increasing burden of non-communicable diseases in Kenya. Knowledge of the effect of alcohol consumption on health and health expenditure will assist in formulating evidence-based policies that will help address these issues. It will also help in reducing the prevalence of risk factors for non-communicable diseases and injuries/violence-related conditions so as to ease the burden of healthcare in Kenyans.

# 2. Literature Review

## 2.1 Theoretical Literature

This section provides the theoretical literature that relates to the households' decision to participate in the market for alcohol and the amount of alcohol to consume, as well as the decision to spend on healthcare. It is based on the notion that consumers' main objective is to maximize utility from consumption of a particular good or service.

### 2.1.1 Consumer theory

Consumer theory of demand originates from the theory of utility maximization, which refers to the satisfaction derived by individuals from the consumption of goods and services. According to Varian (1987), the theory of consumer behaviour in economics assumes that consumers are rational, in that they compare the marginal benefits with marginal costs before making choices and always choose the course of action that maximizes their utility. Given the household is the unit of analysis in this paper, a households' demand for any good is related to its price, price of other goods, income and other relevant factors. The household solves the following utility maximization problem:

$$MaximizeU = U(X_1, X_2, X_3 \ldots\ldots\ldots\ldots X_n, \tau \ldots\ldots\ldots\ldots 1$$

$$SubjecttoY = P_1, X_1 + P_2, X_2 + \ldots + P_n, X_n \ldots\ldots\ldots\ldots 2$$

where $X_1 \ldots_n$ represents consumer goods, $P_1 \ldots_n$ are the corresponding prices of the consumer goods, $\tau$ is a vector of household characteristics and $Y$ is the total income.

To get the demand equation for a particular good, the utility function in equation 1 is optimized given equation 2. An assumption is that utility function is increasing and quasi-concave, thus consumer preferences are rational and continuously made; hence getting the demand for commodity X_1 as:

$$X_1 = f(P, \tau, Y) \ldots\ldots\ldots\ldots 3$$

where $P$ denotes the price of $X_1$ and prices of the other goods, and $X_1$ denotes the quantity of $X_1$ consumed. Consumers are assumed to have full information of the available commodities and their respective prices in the market. They then plan to spend their income in such a way that they derive the highest possible satisfaction.

### 2.1.2 Human capital theory

Grossman (1972) modeled demand for health as a capital good, but argued that health capital is different from other forms of human capital. His model was based

on two justifications: (a) a person's stock of knowledge affects his/her market and non-market productivity, while stock of health determines the total amount of time one can spend producing money earnings and commodity; and (b) what consumers demand when they buy medical services are not services *per se*, but "good health".

Using the concept of consumer theory, Grossman assumed that individuals inherit an initial stock of health that depreciates over time at an increasing rate, at least after some stage in the life cycle. This stock of health can be increased by investment, while death occurs when the stock falls below a certain level, thus individuals choose their length of life. Gross investments in health capital are produced through household production functions, whose direct input include time of the consumer and market goods such as medical care, diet, exercise, cigarette smoking, alcohol consumption, recreation and housing.

In the Grossman model, an individual's health status is not exogenous, but is partly dependent on the resources allocated to its production. Demand for health is for both consumption and investment. It is a consumption commodity because it directly enters the individuals' preference function and investment commodity because it determines the amount of time available for labour and leisure. Healthy individuals are likely to be more productive, thus derive positive returns from their investment in health. Investment in health is not comprised of medical care alone, but also other factors such as education, healthy diet and physical activity.

Using the demand model by Ajakaiye and Mwabu (2007) and Grossman (1972), individuals consume both good and bad goods and services including health with the aim of maximizing utility. The utility function takes the form:

$$U=U(X_{Good},X_{Bad},H) \quad \text{.....4}$$

where,

$X_{good}$ are commodities that yield utility to an individual, but are either health-neutral, such as clothing and music, or they enhance health, for example healthy diet and exercise;

$X_{bad}$ are commodities that yield utility to an individual, but also affect health, such as alcohol abuse and smoking; and

$H$ denotes health status of an individual.

The health status of an individual is also a production function, which depends on other factors, including medical care and goods consumed. The health production function is denoted as:

$$H=f(X_{Good},X_{Bad}M).....5$$

Where $M$=medical care (expenditure on health).

The utility maximization is subject to budget constraints. The consumer must pay for $X$ and any medical care ($M$) used to produce $H$ and overall spending must be limited to the available budget. An individual maximizes utility as stated in equation 4, given that the health production function stated in equation 5 is subject to the budget constraint given by:

$$Z=P_{Good}X_{Good}+P_{Bad}X_{Bad}+P_{M}M.....6$$

where

$Z$ is exogenous income;

$P_{Good}$ are the prices of health neutral and health-promotive goods;

$P_{Badare}$ the prices of health threatening goods; and

$P_{M}$ is the price of medical care.

Solving equation 7 and 8 we get the demand function for health to be

$$M=f(P_{Good},P_{Bad},P_{M},Y).....7$$

Equation 7 gives the quantity of medical care consumed, and $M$ is as defined in equation 5. In spending their incomes, consumers will be maximizing satisfaction derived from good health, thus have time for both labour and leisure.

## 2.2 Empirical Literature

Alcohol consumption as well as medical care depends on a number of factors apart from price. Alcohol consumption, for instance, is influenced by factors such as peer pressure, age, income, sex and many other variables. Alcohol abuse is likely to interfere with the health of an individual, since alcohol abuse is an economic bad and is globally recognized as a risk factor for health. This section looks at some of the factors influencing alcohol consumption in the literature as well as the effects of alcohol on health care expenditure.

### 2.2.1 Factors that influence alcohol consumption

#### Age

Several authors have analyzed the relationship between age and alcohol consumption. Yen and Jensen (1995) found households with relatively young heads spent more on alcohol, findings corroborating the research of Rostron

(2012) where persons aged 18-49 years were more likely to be heavy or moderate drinkers compared to those aged 50 years and above. Similarly, Zyaambo *et al.* (2013) conducted an age-disaggregated study in Zambia using multivariate logistic regression, whose results showed that compared to persons aged 25-34 years, people aged 35-44 years were more likely to consume alcohol by 38 per cent more, while those aged 45 years and above were less likely to consume alcohol by 26 per cent. However, Dias, Oliveira and Lopes (2011), in their Portugal study using logistic regression, found that persons aged 40-59 years were the largest consumers of alcohol compared to those aged 18-39 years, while Siviroj *et al.* (2013) in their Northern Thailand study did not find age to be a significant determinant of alcohol consumption.

**Sex**

Most studies have found association between sex and alcohol consumption. In a study by Aristei, Perali and Pieroni (2005) using the double hurdle model, male-headed households reported higher alcohol expenditure than their female-headed counterparts. Baumann *et al.* (2007) and Rostron (2012) using survival analysis found that alcohol use was more prevalent in men than women, findings comparable to those of Zyaambo *et al.* (2013) where alcohol use in male was higher than that of females by 53 per cent. Further, Dias, Oliveira and Lopes (2011) and Siviroj *et al.* (2013) established that males had a higher probability of engaging in alcohol consumption than women.

**Education**

Results on the relationship between education and alcohol consumption are mixed. Yen and Jensen (1995) using the double hurdle model found that higher levels of education were associated with higher probability of alcohol consumption as well as higher expenditure on alcohol. In line with Yen and Jensen (1995), Rostron (2012) indicated that lower educated individuals had a higher likelihood of not consuming alcohol than higher educated individuals.

Siviroj *et al.* (2013) showed that people with lower levels of education were more likely to be daily drinkers compared to those with higher levels of education. These findings corroborate the research of Dias *et al.* (2011) who compared drinkers and non-drinkers and revealed that people who drink are more likely to be less educated than those who do not drink; and Aristei, Perali and Pieroni (2005) who established that an increase in education reduced the probability of alcohol consumption. Nonetheless, Zyaambo *et al.* (2013) did not establish a significant relationship between education and alcohol consumption.

### Income

Different authors have found conflicting results in regard to level of income and alcohol expenditure. Yen and Jensen (1995) established that expenditure on alcohol increases with increase in incomes, while Rostron (2012) indicated that the number of persons consuming alcohol increased with larger incomes. Correspondingly, Siviroj *et al.* (2013) revealed that middle-income earners had higher chances of being daily drinkers than low-income earners, whilst Rostron (2012) showed that higher income earners had a higher probability of alcohol consumption than low incomes earners.

Additionally, Ground and Koch (2007) using double hurdle model showed that households with higher total expenditure were more likely to purchase alcohol than those with low expenditures. On the other hand, Aristei *et al.* (2005) found that households in lower social classes had a higher probability of consuming alcohol and spent more on alcohol than those in higher classes, while Baumann *et al.* (2007) found a positive relationship between alcohol abuse and low incomes.

### Smoking

In analyzing the relationship between smoking and alcohol consumption, Zyaambo *et al.* (2013) found that smokers were more likely to consume alcohol compared to non-smokers by 49 per cent. Similarly, Dias, Oliveira and Lopes (2011), and Peltzer and Phaswana-Mafuya (2012) showed that smokers were more likely to be alcohol consumers and that tobacco use was associated with alcohol abuse. Moreover, Aristei, Perali and Pieroni (2005) established that smoking increased the probability of alcohol consumption and expenditure on alcohol.

### Location

Aristei, Perali and Pieroni (2005) indicated that urban households had a lower probability of purchasing alcohol and recorded lower alcohol expenditure than rural households. This finding relates to that of Angulo, Gil and Gracia (2001) whose hurdle model results revealed that living in smaller towns was associated with lower probability of purchasing beer and lower levels of consumption. Conversely, Yen and Jensen's (1995) study showed that residents in urban areas had a higher probability of purchasing alcohol and spent more on alcohol than their rural counterparts spent.

However, Ground and Koch (2007) revealed that though urban households had a lower probability of purchasing alcohol, there were no differences between urban and rural households in respect to the amount spent on alcohol. Peltzer and Phaswana-Mafuya (2012) and Siviroj *et al.* (2013) found no significant differences between rural and urban residents in alcohol consumption.

## Alcohol and healthcare expenditure

There is a wide range of literature that suggests that alcohol consumption is a cause or a risk factor for a number of chronic and acute conditions, thus it plays a role in increasing healthcare costs and, eventually, increases in mortality.

Rehm *et al.* (2009) found alcohol consumption to be a major contributor to the global burden of disease, mainly due to the volume of alcohol intake and the drinking patterns, especially binge drinking. They also noted that alcohol use-disorders, cancer, cardiovascular disease, liver cirrhosis and injury are the key disease categories, with alcohol as a causal factor. Parry, Patra and Rehm (2011) in their study also found a strong relationship between alcohol and some of the NCDs (mainly cancer, cardiovascular disease, liver cirrhosis, pancreatitis and diabetes) and called for evidence-based approach in fighting harmful use of alcohol. Further, Jiang *et al.* (2013) showed that spirits consumption was the largest cause of liver mortality, whereas an increase in per capita alcohol consumption increased mortality from liver disease by 10 per cent in Australia.

Research shows that alcohol is a risk factor for breast cancer in females (WCRF/AICR, 2007). Bowlin *et al.* (1997), in a case-control study in the US, found that 25 per cent of breast cancer cases among females aged 20-79 years were found to have drunk alcohol at one point in their life time. Similarly, Feigelson *et al.* (2001) in their 14 years follow-up study found that alcohol consumption was associated with 30 per cent increase in breast cancer mortality among post-menopausal women in the US.

Neramitpitagkul *et al.* (2009) obtained the alcohol-attributable fraction of 33 chronic diseases and 9 acute conditions and summed the total healthcare costs from inpatient and outpatient hospital visits from these diseases and conditions in Thailand. Alcohol consumption accounted for US$ 168 million of healthcare costs, with inpatient costs accounting for 55 per cent of the total costs. Some of the leading causes of these healthcare costs were road traffic injuries, HIV/AIDS due to unsafe sex by people who are drunk, alcohol abuse and alcohol dependence.

In analyzing the relationship between smoking, excess alcohol consumption and physical activity with use of hospital care in Finland, Haapanen *et al.* (1999) found that heavy consumption of alcohol among females was associated with 113 per cent increase in the number of accidents and injuries-prelated hospital admissions than non-drinkers. A study by Laramée *et al.* (2013) estimated that direct costs due to alcohol dependence in Europe ranged from 0.04-0.31 per cent of the country's annual gross domestic product (GDP), with the main cost being that of hospitalization. These findings are similar to those of Putnam (1982) where alcoholics used 50 per cent more of all the healthcare services than their matched

controls who were non-alcoholics, and they used more expensive inpatient services.

Martin *et al.* (2010) analyzed the effects of obesity, overweight, smoking, and alcohol abuse on health status and use of healthcare services in Ireland and revealed that deaths attributed to alcohol were either due to chronic conditions (69%) or acute conditions (31%). Road traffic injuries and self-inflicted injuries accounted for 62 per cent of all the acute conditions. On the other hand, malignant neoplasms and cardiovascular diseases accounted for 50 per cent of all alcohol-attributable deaths in Ireland. According to Livingston and Wilkinson (2013), alcohol consumption caused mortality in males, with the highest impact being on 15-29 year olds, while an increase in per capita alcohol consumption increased male mortality by 1.5 per cent.

To estimate the total mortality and years of potential life lost (YPLL), attributable to alcohol consumption in Chile, Castillo-Carniglia, Kauffman and Pino (2013) found that 9.8 per cent of the total deaths were attributable to alcohol, with 20 per cent of the deaths being due to liver cirrhosis and 15 per cent due to self-inflicted injuries. Alcohol also accounted for 21.5 per cent of the total YPLL in Chile (Castillo-Carniglia *et al.*, 2013). Rostron (2012) also concluded that regular heavy drinkers and former drinkers in the USA had higher mortality than infrequent and non-drinkers.

On the other hand, Haapanen *et al.* (1999) indicated that men who consumed a drink per day recorded fewer hospital admissions by 21 per cent than non-drinkers. A study conducted in the USA also showed that light to moderate drinkers had lower ischaemic heart disease compared to infrequent drinkers (Rostron, 2012). Similarly, Martin *et al.* (2010) revealed that alcohol consumption in Ireland prevented deaths from cholelithiasis, ischaemic heart disease and type 2 diabetes.

Other studies have found no relationship between alcohol consumption and healthcare costs. Leigh, Hurbert and Romano (2005) estimated the effect of lifestyle risk factors on healthcare costs in the USA and found that alcohol consumption was not significant in predicting healthcare cost, findings similar to those of Johar, Jones and Savage (2012) who estimated the effects of risky alcohol consumption, smoking and obesity on health expenditure in Australia.

## 2.3 Critique/Summary of the Literature

Different studies have analyzed the determinants of alcohol consumption using different sets of variables and methods. Most of the studies have used the two-part model to analyze alcohol consumption. On the determinants of alcohol consumption, the study found age, sex, level of education, income and smoking to

be key factors. Factors such as being male, of a lower education level and income status, and a smoker are associated with higher probability of consuming alcohol.

The studies on effect of alcohol on healthcare expenditure mostly focus on individuals and are disease-specific. The main method of analysis of these studies is alcohol attributable fractions of the diseases and injuries. Some of the studies have found a positive relationship between alcohol consumption and healthcare cost, such as Neramitpitagkul *et al.* (2009) and Jiang *et al.* (2013), while other studies such as Rostron (2012) and Haapanen *et al.* (1999) concluded that moderate alcohol consumption is actually good for one's health. Other studies such as Leigh *et al* (2005) found no relationship between alcohol consumption and healthcare cost. None of these studies analyzes the Kenyan context and decision-making at the household level.

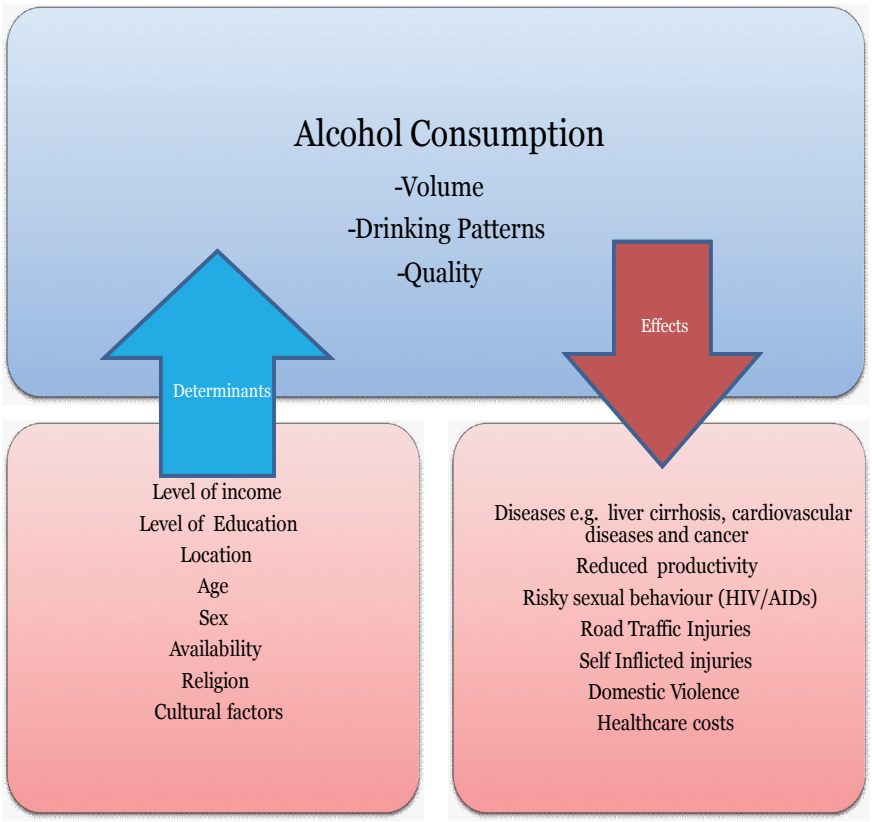
Whereas many studies have estimated determinants of alcohol consumption and effects of alcohol use on healthcare expenditure, none of the studies has analyzed the determinants of alcohol consumption and effect of alcohol use on health expenditure in the Kenyan context. This study contributes by filling the information gap in this research area using Kenyan household data.

# 3. Methodology

## 3.1 Conceptual Framework

From the literature, a number of factors influence alcohol consumption. Some of these factors include: level of income, sex, level of education, location, and availability of alcoholic drinks. The effects of alcohol consumption are felt depending on the quality of alcohol consumed, volume and patterns of drinking (Rehm *et al.*, 2009). Effects of consumption may include: risky sexual behaviour, chronic conditions, domestic violence, and injuries. Some of these effects, such as diseases and injuries, lead to poor health outcomes, thus increase households' expenditure on health as illustrated in Figure 3.1.

**Figure 3.1: Conceptual framework on alcohol consumption and its effects on health**




*Source: Adapted from Rehm et al. (2009)*

## 3.2 Analytical Framework

### 3.2.1 Alcohol consumption

Following the consumer theory, households make choices of consumer goods that maximize their utility subject to some budgetary constraints. Alcohol, which is mostly consumed by the household head, is consumed to maximize utility, given some other underlying factors. Assuming that $X_1$ in equation 2 represents alcohol and that ($X_2$,$X_3$...$X_n$) represents other goods, the function for alcohol consumed will be:

$$Acl=f(P,\tau,Y) \quad \text{.....11}$$

where *P* denotes the price of alcohol and prices of the other goods, and *Acl* the quantity of alcohol consumed. In absence of prices of alcoholic drinks as well as other goods, the assumption is that households face the same relative prices. The amount spent on alcohol (*expAcl*) so as to get the quantity of alcohol needed to maximize utility will therefore be denoted as:

$$expAcl=g(\tau,Y) \quad \text{.....12}$$

Since the quantity of alcohol consumed and the expenditure thereof cannot be negative, consumption can only take a zero or positive value. The maximum amount spent on alcohol in a household is denoted as:

$$expAcl=max\{0,g(\tau,Y)\} \quad \text{.....13}$$

To operationalize equation 12, we assume that the expenditure function is linear and the optimal outcome is observed with errors. The expenditure model will therefore be stated as:

$$expAcli=\beta xi+v_i if \beta x_i+v_i>0; expAcl_i=0 \ otherwise \quad \text{.....14}$$

Equation 14 is equivalent to the Tobit model (Tobin, 1958), where $x_i$ is a vector of explanatory variables, including the household characteristics, $\beta$ is a set of parameters to be estimated, and $v_i$ is the error term, which is normally distributed. The Tobit model assumes that the zero observations are a corner solution, such that households do not purchase alcohol at its current prices and income levels. The corner solution implies that under some conditions, some of the households with zero expenditure may end up incurring positive expenditure.

However, as stated in Angulo *et al.* (2001), in consumption of goods such as alcohol, the large number of reported zero expenditure may also be due to the short survey period in which the data is recorded, thus households did not purchase alcohol during the period under survey. Humphreys (2013) also indicated that the zeros could be as a result of abstention, or that the household had no choice in the

outcome. In such cases, zero expenditure will always be observed irrespective of income and prices.

With the presence of zeros, a model that can take into account other reasons for zero expenditure, including corner solutions, would be more appropriate. The two-part model, also known as double hurdle model by Cragg (1971), is an extension of the Tobit model and it takes care of other reasons for zero expenditure. The model was used by Yen and Jensen (1995); Angulo, Gil and Gracia (2001); Aristei, Perali and Pieroni (2005); Ground and Koch (2007); and Tian and Liu (2011), among others, in modeling alcohol expenditure.

The two-part model is based on the reasoning that observations of positive alcohol expenditures are in two steps. The first stage is a binary choice variable indicating whether a particular household is a potential alcohol consumer or not. This step is referred to as the participation decision. After making the participation decision, potential consumers then decide on how much they should actually consume, which is the second step and is known as the consumption decision.

Following the model by Wooldridge (2002), we observe a latent participation variable in the participation equation, which gives the probability of alcohol consumption. This can be denoted as:

$$p_i^* = ag\_i + \mu \quad \text{.....15}$$

where $p_i^*$ is a latent participation variable, which takes the value 1 if households decide to buy alcohol, and *0* otherwise. $g_i$ is a vector of explanatory variables for the participation equation. The second part is the consumption decision, which gives the quantity consumed by a potential consumer. This is denoted as:

$$c_i^* = \beta x_i + v \quad \text{.....16}$$

Equation 16 is similar to the tobit equation 14, $c_i^*$ is a latent consumption variable, $x_i$ are a set of variables that explain consumption as defined in equation 11. $\mu_i$ and $v_i$ are error terms, which are independently and normally distributed (Yen and Jensen, 1995). Positive alcohol expenditures are only observed if both $p_i^*$ and $c_i^*$ are positive. This can be denoted as:

$$expAcl_i = c_i^* \; if \; p_i^* > 0 \; and \; c_i^* > 0; expAcl_i = 0 \; otherwise \quad \text{.....17}$$

Equation 17 shows that zero alcohol expenditure are recorded when households decide not to participate in the market ($p_i^*=0$), or having made the decision to participate ($p_i^*=1$), they still consume ($c_i^*=0$). According to Angulo, Gil and Gracia (2001), when $p_i^*=0$, the explanatory variables in the participation equation are irrelevant because zero consumption is solely due to conscientious abstention. However, if $p_i^*=1$ and $c_i^*=0$, potential consumers fail to buy alcohol due to the existing levels of exogenous variables. The two-part model is therefore

more appropriate for this study, since it takes care of zero responses arising from either conscientious abstention or other factors.

From equation 15, the participation equation to be estimated in this study is stated as:

$$expAcl_i=\beta_0+\beta_1 hhsize+\beta_2 Sexhhhd_i+\beta_3 Agehd_i+\beta_4 agesq_i+\beta_5 marstat_i+\beta_6 residence_i+\beta_7 yrsch_i+\beta_8 tobdummy_i+\beta_9 child014\_dummy_i+\beta_{10} log\_ttexpd+\in_i \quad \text{.....18}$$

Equation 18 is the first part of the model, which gives the likelihood that a household will participate in the market or not and is estimated using a logistic regression.

Given equation 16, the second part of the model is as stated in equation 19. It is the decision on the level of expenditure conditional on a positive outcome in the first part and is estimated as a linear model using ordinary least squares (OLS) regression.

$$log(expAcl_i)=n_0+n_1 hhsize+n_2 Sexhd_i+n_3 Agehd_i+n_4 agesq_i+n_5 marstat_i+n_6 residence_i+n_7 yrsch_i+n_8 tobdummy_i+n_9 child014\_dummy_i+n_{10} log\_ttexpd_i+\in_i \quad \text{.....19}$$

The log transformation of the alcohol expenditure in the second part is done in order to normalize the error term, since expenditure data are generally skewed to the right.

### 3.2.2 Healthcare expenditure

To achieve the second objective on effects of alcohol consumption on alcohol expenditure, this study uses the human capital theory (Grossman, 1972) and the demand model by Ajakaye and Mwabu (2007) as stated in equation 8 and 10, where healthcare is a function of a set of variables, including the consumption of the economic 'goods' and 'bads'. Since consumption of alcohol may lead to adverse health outcomes, households will then incur health expenditure so as to restore their stock of health.

Healthcare is considered as a good, which derives utility to the consumer. The study further uses the consumer theory of utility maximization. Assuming $X_2$ in equation 1 is healthcare, the demand for health care(Hc) will be expressed as:

$$Hc=f(P,\tau,Y) \quad \text{.....20}$$

where $P$ denotes the price of healthcare and prices of other goods, $\tau$ is a vector of household characteristics, $Y$ is the total income and $Hc$ denotes the amount

of healthcare demanded. Since there is no information on prices, it is assumed that households are facing the same relative prices. The equation for healthcare expenditure (*Hce*) will therefore be denoted as:

$$Hce=g(\tau,Y) \quad \text{.....21}$$

Mullay (2009) and Dow and Norton (2003) noted that some of the characteristics of data on health expenditures are non-negative, and significant fractions of observations are reported zero values, thus the maximum amount spent on healthcare in a household is denoted as:

$$Hce=max\{0,g(\tau,Y)\} \quad \text{.....22}$$

Given equation 21, we assume that the expenditure function is linear and the optimal outcome is observed with errors. The expenditure model will therefore be denoted as:

$$Hce_i=\phi q_i+v_i \text{ if } \phi q_i+v_i>0;\ Hce_i=0 \text{ otherwise} \quad \text{.....23}$$

where $q_i$ is a vector of explanatory variables, including alcohol consumption and household characteristics, $\phi$ is a set of parameters to be estimated and $v_i$ is the error term.

Given the nature of health expenditure, two main methods may be used to analyze the effect of alcohol use on healthcare expenditure; two-part model and the Heckit model. This study used the two-part model as explained by Duan *et al.* (1983) and emphasized by Dow and Norton (2003), who observed that Heckit model was designed to address selection bias when analyzing potential outcomes, but research on health expenditure is geared towards the actual outcomes. The reasoning was that health expenditure that are not incurred have no impact on healthcare budgets, and selection bias does not exist when modeling actual outcomes. Heckit models require exclusion assumptions, if it is used to analyze health expenditure. However, such assumptions may not exist and when they do, it may not be easy to defend them (Dow and Norton, 2003). Johar, Jones and Savage (2012) were of the same observation and used the two-part model in estimating the impact of lifestyle choices on healthcare expenditure in Australia.

From equation 23, based on Cragg (1971), we first estimate the probability of incurring positive healthcare expenditure $\phi$ which is the participation equation. This is denoted as:

$$s_i^*=\alpha f_i+\mu_i \quad \text{.....24}$$

where $s_i^*$ is a latent participation variable, which takes the value 1 if households decide to have positive healthcare expenditure and 0 otherwise. $f_i$ is a vector of explanatory variables for the participation equation. The second part is the

consumption decision, which gives the level of expenditure conditional on being observed. This is denoted as:

$$e_i^* = \beta x_i + v_i \quad \text{.....25}$$

Given equation 24, the participation equation to be estimated in this study is denoted as:

$$Hceann = \alpha_1 + \alpha_2 Sexhd_i + \alpha_3 Agehd_i + \alpha_4 agesq_i + \alpha_5 marstat_i + \alpha_6 residence_i + \alpha_7 yrsch_i + \alpha_8 schsq_i + \alpha_9 tobdummy_i + \alpha_{10} acldummy_i + \alpha_{11} 0\_14_i + \alpha_{12} 15\_24_i + \alpha_{13} 25\_34_i + \alpha_{14} 35\_44_i + \alpha_{15} 45\_54_i + \alpha_{16} 55\_above_i + \omega_i \quad \text{.....26}$$

Equation 26 is the first part of the model and will be estimated as a logistic regression of the participation decision of having positive or zero health expenditure.

The second part is the outcome equation based on equation 25. It is a linear model estimated using OLS, with positive healthcare expenditure being the independent variable, but with same regressors as in equation 26. This is as shown in equation 27:

$$log(Hceann) = m_1 + m_2 Sexhd_i + m_3 Agehd_i + m_4 agesq_i + m_5 marstat_i + m_6 residence_i + m_7 yrsch_i + m_8 schsq_i + m_9 tobdummy_i + m_{10} acldummy_i + m_{11} 0\_14_i + m_{12} 15\_24_i + m_{13} 25\_34_i + m_{14} 35\_44_i + m_{15} 45\_54_i + m_{16} 55\_above_i + \omega_i \quad \text{.....27}$$

The log transformation of the expenditure on health is done in order to normalize the error term, since expenditure data is generally skewed to the right.

## 3.3 Average Marginal Effects

This study will also give the combined marginal effects in the first and second parts of the model. The marginal effects in the first part of the two part model measure the effect of the explanatory variables on the probability of a household to consume alcohol. In the second part, the marginal effects measure how a change in variable affects the level of alcohol expenditure conditional on consumption.

Combining these two marginal effects gives the unconditional marginal effects. These marginal effects take into account both the first and the second part of the model. They give the overall responsiveness of a household's expenditure on alcohol to a change in the explanatory variables (Yen and Jensen, 1995). It is a product of the probability of a positive outcome in the first part and the expected value of expenditure in the second part, conditional on positive outcome in the

first part. This can be denoted as:

$$E(\widehat{Alcexp} \mid x) = pr\left(\widehat{Alcexp} > 0 \mid x\right)E\left(Alcexp \mid \widehat{Alcexp} > 0, x\right) \quad ..28$$

## 3.4 Description and Measurement of Variables

The description and measurement of the variables used in the study as well as prior expectations are as shown in Table 3.1.

**Table 3.1: Description and measurement of variables**

| Variable | Description | Measurement | Expected Sign |
|---|---|---|---|
| ExpAcl | Household's annual alcohol consumption | Continuous variable (amount spent on alcohol in Ksh) | Dependent variable |
| Hceann | Household's annual healthcare expenditure | Continuous variable (Total amount spent on healthcare) | Dependent variable |
| Acldummy | Alcohol consumption | Dummy variable (1=consumption and zero otherwise) | + |
| Hhsize | Household size | Continuous variable (Total number of members in the household) | + |
| 0_14 | Age category 0 to 14 years | Continuous variable (Number of household members aged 0 to 14 years) | + |
| 15_24 | Age category 15 to 24 years | Continuous variable (Number of household members aged 15 to 24 years) | + |
| 25_34 | Age category 25 to 34 years | Continuous variable (Number of household members aged 25 to 34 years) | - |
| 35_44 | Age category 35 to 44 years | Continuous variable (Number of household members aged 35 to 44 years) | - |
| 45_54 | Age category 45 to 54 years | Continuous variable (Number of household members aged 45 to 54 years) | + |
| 55_above | Age category 55 years and above | Continuous variable (Number of household members aged 55 years and above) | + |
| Agehd | Age of the household head | Continuous variable (Age of the household head in years) | + |
| Agesq | Age of the household head squared | Continuous variable (Age of the household head in years squared) | - |
| Sexhd | Sex of the household head | Categorical variable (1=male, 2=female) | - |
| Marstat | Marital status of the household head | Dummy variable (1=married, 0 otherwise) | - |

| | | | |
|---|---|---|---|
| yrsch | years of schooling of the household head | Continuous variable (Number of years of schooling of the household head) | - |
| Residence | Location of the household, 1=rural, 2=urban | Categorical variable (1=rural, 2=urban) | + |
| Tobdummy | tobacco consumption, | Dummy variable (1=consumption, 0 otherwise) | + |
| child014_ dummy | Presence of a household member aged 0-14 years, | Dummy variable (1=present, 0=otherwise) | _ |
| log_ totalexpd | Log of the household's total annual expenditure | Continuous variable (log of the total annual household expenditure) | + |

## 3.5 Data Type and Sources

The study uses the latest available secondary cross sectional data, which is obtained from the Kenya Integrated Household Budget Survey (KIHBS) conducted by Kenya National Bureau of Statistics in the year 2005/2006. The survey was done in 12 months in 1,343 randomly selected clusters across all districts in Kenya, and comprised 861 rural and 482 urban clusters. In each of the clusters sampled, 10 households were randomly selected, resulting in a total sample size of 13,430 households.

The survey gives indepth information on household expenditure as well as social economic and demographic characteristics of households. Data on consumption of regular food items was recorded as the amount of the household purchased, consumed or acquired for the past seven days and alcohol consumption fell in this category. Information on prices was not recorded, but households gave the total amount consumed and the expenditure. The information provided was that of the households and not the individuals.

The analysis involved merging of a number of modules from KIHBS dataset to create a complete set of all variables, thus the number of observations is not uniform across the different variables. The analysis of expenditure in the first part takes into account all the households after data cleaning, while the second part takes only the households with positive expenditure.

# 4. Empirical Results and Discussion

## 4.1 Descriptive Statistics

The descriptive statistics of the variables used to estimate the factors influencing alcohol consumption and effects of alcohol consumption on healthcare expenditure are as presented in Table 4.1. The unit of analysis is the household and summary statistics presented are the mean, standard deviation, minimum and maximum.

Results indicate that the average household size was five members, with some of the households comprising of one member, while others had up to 29 members. The total annual household expenditures that were used as a proxy for income was on average Ksh 147,829, but it had extreme cases with some households spending as low as Ksh 1,160 while others spent slightly above Ksh 9 million. The results presented in Table 4.1 also contain all the continuous variables used in the analysis.

Descriptive statistics showing regional alcohol consumption are as shown in Table 4.2. The regional results show the number of households interviewed across regions and the number of households that reported positive alcohol expenditure. The total expenditure on alcohol for each region is used in computing the average expenditure on alcohol for each household, while the percentage of households consuming alcohol is calculated as a ratio of the households using alcohol to the total number of households in that region.

**Table 4.1: Summary statistics**

| Variable | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Households annual health expenditure | 12,893 | 4,960.347 | 3,6630.34 | 0 | 1,833,000 |
| Household size | 13,210 | 5.0497 | 2.8094 | 1 | 29 |
| Age of the household head | 13,152 | 44.2619 | 15.2618 | 20 | 97 |
| Years of schooling of the household head | 9,769 | 8.6588 | 3.6279 | 0 | 19 |
| Annual household expenditure on alcohol | 13,157 | 1,984.114 | 9304.043 | 0 | 169,520 |
| Annual household expenditure on tobacco | 13,157 | 1,057.829 | 5357.278 | 0 | 171,600 |
| Total annual expenditure | 13,145 | 147,829 | 278,668 | 1,160 | 4,048,007 |

*Source: KIHBS 2005/06*

**Table 4.2: Regional alcohol consumption**

| Region | Total no. of households | Households using alcohol | Total alcohol expenditure | Average household expenditure | Percentage of households using alcohol |
|---|---|---|---|---|---|
| Nairobi | 672 | 110 | 5,911,991 | 53,745.37 | 16 |
| Central | 1,481 | 119 | 4,714,228 | 39,615.36 | 8 |
| Coast | 1,255 | 182 | 5,232,546 | 28,750.25 | 15 |
| Eastern | 2,391 | 260 | 7,807,471 | 30,028.73 | 11 |
| North Eastern | 509 | 1 | 33,280 | 33,280.00 | 0.20 |
| Nyanza | 2,111 | 229 | 5,993,820 | 26,173.89 | 11 |
| Riftvalley | 3,285 | 654 | 14,600,000 | 22,324.16 | 20 |
| Western | 1,508 | 265 | 3,522,477 | 13,292.37 | 18 |
| Nation wide | 13,212 | 1,820 | 47,815,813 | 26,272.42 | |

*Source: KIHBS 2005/2006*

Results indicate that Rift Valley region had the highest number of households consuming alcohol, with two in every ten households recording positive alcohol consumption. This was closely followed by Western region (8%), Nairobi (16%) and Coast (15%). Central region, which is perceived to have high alcohol consumption is at 8 per cent, while North eastern region recorded 0.2 per cent. The reasoning may be that due to cultural considerations, some regions such as Western and Rift Valley where *busaa* is consumed in large quantities tolerate alcohol consumption as a mode of social behaviour than other regions.

On the amount spent on alcohol per household, Nairobi region has the highest level of expenditure. This may be an indicator of the quality of alcohol consumed in this region, mostly being spirits, beer and wine as opposed to traditional home-made brew. Rift Valley region, though it recorded the highest number of households using alcohol, had an average expenditure of Ksh 22,324, which is below the national average of about Ksh 26,272. This may imply that much of the alcohol consumed in Rift valley region is traditional brew, and this is the same case in Western region, which had an average expenditure of Ksh 13,292.

## 4.2 Regression Results

### 4.2.1 Factors influencing alcohol consumption

The results of equation 18, which is a two-part model on the factors influencing alcohol consumption, are presented in Table 4.2. The first part gives the results of the logistic equation, which measures the probability of participation. The second

section provides the regression results of the level of log of alcohol expenditure conditional on participation.

### The participation decision results (logit results)

The analysis of the logit regression gives the likelihood that a household would purchase alcohol. The coefficient for the dummy on the presence of children aged 0 to 14 years and below is highly significant at 1 per cent, an indication that having children in the household reduces the probability of participation in the market for alcohol. With the presence of children, the adult members of the household may be more keen on their behaviour so that they can set a good example to the young ones.

**Table 4.3: Two part model results on determinants of alcohol consumption**

| Alcohol expenditures | Coef. | Std. Err. | Z | P>z |
|---|---|---|---|---|
| Logit | | | | |
| Hhsize | -0.02554 | 0.01562 | -1.63 | 0.102 |
| sexhd | -0.99561*** | 0.11086 | -8.98 | 0.000 |
| agehd | 0.058409*** | 0.01457 | 4.01 | 0.000 |
| agesq | -0.00061*** | 0.00015 | -3.95 | 0.000 |
| Marstat | -0.32161*** | 0.10049 | -3.2 | 0.001 |
| Residence | -0.1042 | 0.07442 | -1.4 | 0.161 |
| Yrsch | -0.02076** | 0.01022 | -2.03 | 0.042 |
| Tobdummy | 1.713012*** | 0.06933 | 24.71 | 0.000 |
| child014_dummy | -0.37542*** | 0.09187 | -4.09 | 0.000 |
| log_totalexpd | 0.413659*** | 0.04638 | 8.92 | 0.000 |
| _cons | -6.17697 | 0.55979 | -11 | 0.000 |
| OLS regression (log of alcohol expenditure) | | | | |
| Hhsize | -0.05346*** | 0.02681 | -3.99 | 0.000 |
| sexhd | -0.30301** | 0.20437 | -2.97 | 0.003 |
| agehd | 0.016127 | 0.0255 | 1.27 | 0.206 |
| agesq | -0.00022* | 0.00027 | -1.65 | 0.100 |
| Marstat | -0.07616 | 0.1719 | -0.89 | 0.376 |
| Residence | 0.18626*** | 0.13649 | 2.73 | 0.006 |
| Yrsch | 0.014159 | 0.01762 | 1.61 | 0.108 |
| Tobdummy | 0.148799*** | 0.11427 | 2.6 | 0.009 |
| child014_dummy | -0.1986** | 0.16482 | -2.41 | 0.016 |
| log_totalexpd | 0.738696*** | 0.08308 | 17.78 | 0.000 |
| _cons | 0.353023 | 1.01218 | 0.70 | 0.485 |

*Note: Asterisks indicate level of significance: ***=1%, **=5%, *=10%*

As expected from the reviewed literature, the coefficient for tobacco dummy is highly significant at 1 per cent and has a positive sign, indicating that being a smoker significantly increases the probability of participation. This result is in line with the study hypothesis that smoking increases the probability of alcohol participation and also consistent with the findings of Zyaambo *et al.* (2013) and Dias, Oliveira and Lopes (2011). This is an indication of complimentarity between alcohol consumption and tobacco use. Another finding that is consistent with the literature is that of the sex of the household head, which is also highly significant at 1 per cent and indicates that female-headed households are less likely to participate in alcohol consumption compared to their male-headed counterparts. This is attributed to cultural reasons, where females who choose to engage in alcohol consumption are seen to be doing it contrary to the societal norms.

Household expenditure, which is a proxy for income, is highly significant at 1 per cent and has a positive sign indicating that increase in income increases the probability of participation. The estimated coefficient for the years of schooling of the household head is significant at 5 per cent and has a negative sign, indicating that increasing years of education reduces the probability of participation. This is not surprising given that more educated people would be more conscious of their choices and may have more information on the dangers of engaging in unhealthy behaviour, which is consistent with findings of Tian and Wang (2010). Marital status of the household head is also important in explaining the alcohol participation behaviour. A married household head reduces the probability of participation in that household compared to an unmarried household head.

The coefficients of age and age-squared of the household head are both highly significant at 1 per cent level in the participation equation and have opposite signs, denoting an inverted u-shaped relationship. An increase in the age of the household head increases the probability of participation. However, this relationship has some maximum age after which an increase in age of the household head reduces the probability of alcohol consumption. This is an indication that there exists a life-cycle pattern in alcohol consumption, where households with elderly heads are less likely to participate in alcohol consumption compared to their younger counterparts. This is possible since, as people grow older, they tend to be more conscious about their health and also have fewer things to worry about compared to the younger family heads (Aristei, Perali and Pieroni, 2005).

**The consumption decision (OLS results)**

The OLS results present the finding of consumption decision conditional on participation. The dependent variable is the log of alcohol expenditure, while the explanatory variables are the same as used in the logit equation. It gives the effects of the changes in explanatory variables on the level of alcohol expenditure. The

coefficient for log of household's total annual expenditure is highly significant at 1 per cent, thus income is an important determinant of household's expenditure on alcohol. An increase in income by 1 per cent increases household expenditure on alcohol by 0.73 per cent. This shows that once the decision to participate has been made, the level of consumption would then increase as income increases.

The analysis of the sex dummy variable in the consumption equation is as in the participation equation, with female-headed households spending 30 per cent less in alcohol expenditure compared to male-headed households. This is consistent with the results of other studies on alcohol, such as Aristei, Perali and Pieroni, (2005). As in the participation decision, it may be attributed to societal norms where females are not expected to consume too much alcohol, as this is seen as irresponsible behaviour.

Corresponding to the participation equation, the coefficient for tobacco dummy is highly significant at 1 per cent, indicating that being a smoker significantly increases the amount households spend on alcohol. Households consuming tobacco spend 15 per cent more on alcohol than those that do not. This is an indicator that addictive and habit forming goods are likely to be consumed together. The coefficient for children dummy is significant at 1 per cent and indicates that households having children aged 0-14 years spend 20 per cent less on alcohol than other households. The idea is that conditional on participation, people may tend to drink alcohol in moderation when children are around (Yen, 2005).

The dummy for residence is very significant and has a positive sign, indicating that urban residents spend 19 per cent more on alcohol than their rural counterparts, though it was not significant in the participation decision. This implies that though residence does not influence participation, those who choose to participate and reside in urban areas spend more on alcohol than their rural counterparts. This may be attributed to strong peer pressure as well as greater exposure to marketing messages that show alcohol as a superior good in urban residents compared to rural residents (Blaylock and Blisard, 1993).

Unlike in the participation decision, the marital status and years of schooling of the household head are not important in determining the amount spent on alcohol. This means that once the decision to consume alcohol has been made, the consumer's years of schooling do not influence the amount of alcohol consumed and so is marital status. The coefficients of age and age squared of the household head, which were statistically significant in the participation equation, are also not significant in the consumption equation. Thus, conditional on the participation decision, the quantity of alcohol consumed is not determined by the age of the household head.

The coefficient of the household size also behaves differently in the participation and consumption equations. The coefficient of the size of the household is highly significant at 1 per cent in the consumption equation, but was not significant in the participation equation. Thus, household size is important in determining the amount spent on alcohol. An increase in household size by 1 member reduces the amount spent on alcohol by 5 per cent. As the number of people in a household increases, there is a possibility that some of those members do not support alcohol consumption. Studies by Angulo, Gil and Gracia (2001) and Aristei, Perali and Pieroni (2005) showed that single member households spent more on alcohol than other households, implying that the size of household is important in consumption decision.

### 4.2.2 Effects of alcohol consumption on healthcare expenditure

Results of equation 23 are presented in Table 4.4. The first part is the logistic regression, which gives the probability of incurring healthcare expenditure, while the second part is a regression of the log of healthcare expenditure conditional on being observed.

**The participation equation**

The coefficients for the household members aged 0-14; 15-24; and 25-34 years are highly significant at 1 per cent and have a positive sign showing the direction of the relationship. This implies that a household with members in the said age brackets has a high probability of incurring healthcare expenditure. Thus, household composition influences the probability of a household incurring healthcare expenditure.

Female-headed households are also more likely to participate in healthcare expenditure than the male-headed, while married household heads have a higher probability of spending on health than their unmarried counterparts. However, alcohol consumption is not important in explaining the probability of incurring healthcare expenditure, findings consistent with those of Johar, Jones and Savage (2012) and Leigh, Hubert and Romano (2005).

**The consumption equation**

Unlike the participation equation, household composition at all age categories is important in explaining the amount spent on health, though at different magnitudes. An additional member to the household aged 0-14 years increases healthcare expenditure by 3 per cent. This is significant at 5 per cent. An additional member aged 15-24 years increases healthcare expenditure by 8 per cent. Female-headed households spend 23 per cent more on health than the male-headed

households, while those whose heads are married spend 16 per cent more on health than the unmarried ones. Similarly, urban households spend 46 per cent more on healthcare than households in the rural areas.

**Table 4.4: Two part model results on effects of alcohol consumption on healthcare expenditure**

| Hceann | Coef. | Std. Err. | z | P>z |
|---|---|---|---|---|
| logit-(First part) | | | | |
| hhmembersaged0_14 | 0.160645*** | 0.016279 | 9.87 | 0.000 |
| hhmembersaged15_24 | 0.09813*** | 0.021479 | 4.57 | 0.000 |
| hhmembersaged25_34 | 0.136602*** | 0.037581 | 3.63 | 0.000 |
| hhmembersaged35_44 | 0.045646 | 0.05326 | 0.86 | 0.391 |
| hhmembersaged45_54 | -0.05917 | 0.065936 | -0.90 | 0.369 |
| hhmembersaged55_ above | 0.068261 | 0.070691 | 0.97 | 0.334 |
| Sexhhhead | 0.223832*** | 0.066266 | 3.38 | 0.001 |
| Agehhhead | 0.007226 | 0.012995 | 0.56 | 0.578 |
| Hhheadagesquard | 0.0000157 | 0.000138 | 0.11 | 0.909 |
| Marstatushhhead | 0.283974*** | 0.067791 | 4.19 | 0.000 |
| Residence | 0.083629 | 0.052937 | 1.58 | 0.114 |
| Yrsofschoolinghhhead | 0.002508 | 0.007174 | 0.35 | 0.727 |
| Acldummy | 0.001383 | 0.067169 | 0.02 | 0.984 |
| _cons | -0.49499 | 0.29154 | -1.70 | 0.090 |
| OLS regression (log of HCE) | | | | |
| hhmembersaged0_14 | 0.02966*** | 0.012541 | 2.36 | 0.018 |
| hhmembersaged15_24 | 0.081081*** | 0.016857 | 4.81 | 0.000 |
| hhmembersaged25_34 | 0.2421*** | 0.03004 | 8.06 | 0.000 |
| hhmembersaged35_44 | 0.21348*** | 0.043089 | 4.95 | 0.000 |
| hhmembersaged45_54 | 0.134513** | 0.053978 | 2.49 | 0.013 |
| hhmembersaged55_ above | 0.169857*** | 0.057191 | 2.97 | 0.003 |
| Sexhhhead | 0.226608*** | 0.05708 | 3.97 | 0.000 |
| Agehhhead | -0.02341** | 0.011296 | -2.07 | 0.038 |
| Hhheadagesquard | 0.00036** | 0.000118 | 3.05 | 0.002 |
| Marstatushhhead | 0.163861*** | 0.061922 | 2.65 | 0.008 |
| Residence | 0.456503*** | 0.044689 | 10.22 | 0.000 |
| Yrsofschoolinghhhead | 0.08243*** | 0.006037 | 13.65 | 0.000 |
| Acldummy | -0.07531 | 0.057268 | -1.32 | 0.188 |
| _cons | 5.240722 | 0.262349 | 19.98 | 0.000 |

*Notes: Asterisks indicate level of significance: ***=1%, **=5%, *=10%*

The coefficient of age and age squared are significant in the outcome equation, but have opposite signs. An increase in the age of the household head reduces the expenditure on healthcare by 2 per cent. However, this relationship has some maximum age after which an increase in age of the household head increases the healthcare expenditure. This is mostly due to the fact that aging comes with a number of health problems. The years of schooling of the household head are also significant. A household head's increase in schooling by 1 year increases the expenditure on health by 8 per cent. More educated heads have more information, making them more likely to engage in preventive healthcare and are more conscious about their health, thus seeking care more often.

The coefficient for variable of interest in this study, which is alcohol consumption, is not significant in the consumption equation. This result is consistent with those of Johar, Jones and Savage (2012) and Leigh, Hubert and Romano (2005). The coefficient of alcohol consumption has different signs in the participation and outcome equation, making the effect of alcohol consumption on healthcare expenditure indeterminate. This result may be attributed to the nature of the data used in the analysis. Very few households recorded positive alcohol expenditure, out of which only 1,366 are analyzed in this study.

Another explanation for the results is that the household data mainly deals with averages as opposed to the individuals participating in a particular behaviour. This average reduces the magnitude of the issue at hand. The other reason for the negative effect of alcohol consumption on healthcare expenditure may be as stated by Johar, Jones and Savage (2012), that non-drinkers could be abstaining from alcohol due to the high cost of health problems. Also, from the literature, the health conditions arising from alcohol consumption, such as liver cirrhosis are lagged and thus may occur much later in life. Also, an analysis of the particular individuals' consuming alcohol as opposed to households would give more clear results.

## 4.3 Average Marginal Effects

Table 4.5 shows the average marginal effects for the full two-part model with logit and OLS, with log of alcohol expenditure reported in Table 4.3.

All the explanatory variables are significant at 1 per cent level except for area of residence and years of schooling by the household head. An increase in household size by one member reduces alcohol expenditure by Ksh 179, while female-headed households spend Ksh 2,512 less on alcohol than male-headed households.

Age of the household head has a positive marginal effect of Ksh 143, while age squared has a negative marginal effect of Ksh 2. This marginal effect captures the

**Table 4.5: Combined expected values of determinants of alcohol consumption**

| Alcohol expenditure | dy/dx | Delta-method Std. Err. | z | P>z |
|---|---|---|---|---|
| hhsize | -179.333 | 44.90796 | -3.99 | 0.000*** |
| sexhhhead | -2512.8 | 346.1077 | -7.26 | 0.000*** |
| agehhhead | 143.2687 | 41.57961 | 3.45 | 0.001*** |
| hhheadagesquard | -1.61862 | 0.437426 | -3.70 | 0.000*** |
| marstatushhhead | -757.093 | 281.0422 | -2.69 | 0.007*** |
| residence | 285.0889 | 216.6398 | 1.32 | 0.188 |
| yrsofschoolinghhhead | -0.91034 | 28.52293 | -0.03 | 0.975 |
| tobdummy | 3386.685 | 216.5685 | 15.64 | 0.000*** |
| child014_dummy | -1159.59 | 269.067 | -4.31 | 0.000*** |
| log_totalexpd | 2584.853 | 218.0208 | 11.86 | 0.000*** |

Notes: Asterisks indicate level of significance: ***=1%, **=5%, *=10%

inverted u-shaped relationship in Table 4.2. Married household heads spend Ksh 757 less on alcohol than their non-married counterparts, while households with children aged 14 years and below spend Ksh 1,160 less than those without children in the same age bracket.

The issue of complimentary goods is very clear, in that tobacco use has an incremental effect of Ksh 3,386 on alcohol expenditure. Further, higher incomes increase expenditure on alcohol by Ksh 2,585.

The average marginal effects for effect of alcohol consumption on healthcare expenditure have the same trend as Table 4.4 with the age bracket 15 to 34 years recording the highest marginal effect of Ksh 1,223 in the age group's category. All the marginal effects are significant apart from alcohol consumption, thus the study cannot conclude on the issue of alcohol consumption of healthcare expenditure. The reasons are as stipulated in section 4.2.2.

**Table 4.6: Combined expected values of effect of alcohol consumption on healthcare expenditure**

| Health care expenditures | dy/dx | Delta-method Std. Err. | z | P>z |
|---|---|---|---|---|
| Hhmembersaged 0_14 | 309.2357 | 58.35004 | 5.30 | 0.000*** |
| Hhmembersaged 15_24 | 467.8821 | 79.93439 | 5.85 | 0.000*** |
| Hhmembersaged 25_34 | 1223.925 | 147.4955 | 8.30 | 0.000*** |
| Hhmembersaged 35_44 | 996.4356 | 204.2967 | 4.88 | 0.000*** |
| Hhmembersaged 45_54 | 530.5142 | 251.4133 | 2.11 | 0.035** |
| Hhmembersaged 55_above | 828.1782 | 267.3586 | 3.10 | 0.002*** |
| sexhhhead | 1251.839 | 266.594 | 4.70 | 0.000*** |
| agehhhead | -95.7223 | 52.26728 | -1.83 | 0.067* |
| hhheadagesquard | 1.614116 | 0.5492095 | 2.94 | 0.003*** |
| marstatushhhead | 1040.383 | 285.5304 | 3.64 | 0.000*** |
| residence | 2115.291 | 220.7732 | 9.58 | 0.000*** |
| yrsofschooling~d | 368.0148 | 31.24786 | 11.78 | 0.000*** |
| acldummy | -332.164 | 264.6829 | -1.25 | 0.209 |

*Notes: Asterisks indicate level of significance: ***=1%, **=5%, *=10%*

# 5. Conclusion and Policy Recommendations

## 5.1 Conclusion

The study investigates the factors influencing alcohol consumption and the effects of alcohol consumption on healthcare expenditure in Kenya, using data from KIHBS 2005-2006. The analysis made use of the Cragg's double hurdle model, which is also known as two-part model when applied to cross-sectional data. The model splits the households' decision into two, the participation and the consumption decision. Participation decision is examined in the context of a logistic model, while the consumption decision, given the decision to consume, is analyzed with a log-linear regression.

The results show that the variables that influence the probability of participation in alcohol consumption are: having children aged between 0-14 years, level of education, marital status of the household head, age of the household head, level of income, sex of the household head, and tobacco consumption.

Households consuming tobacco have a higher probability of alcohol participation than those that do not use tobacco. An increase in the age of the household head is also associated with a higher probability of alcohol consumption, but up to a certain age, where further increase leads to a decrease in the likelihood of alcohol consumption. Female-headed households have a lower probability of alcohol participation, so are households with children aged 0-14 years. Higher incomes and higher levels of education also increase the probability of alcohol consumption.

The estimated consumption model of the alcohol expenditures indicates that increase in the size of the household, female-headed households, households whose head is married, and presence of children below 14 years of age, all reduce the expenditure on alcohol. Households consuming tobacco products as well as households located in urban areas spend more on alcohol than their counterparts. An increase in household expenditure is also associated with an increase in alcohol expenditure.

The second objective of the study on effects of alcohol consumption on healthcare expenditure indicates that alcohol consumption is not important in determining healthcare expenditure, both at the participation and the consumption level.

## 5.2 Policy Recommendations

The findings of this study have a bearing in that any public policy with the aim of discouraging alcohol consumption should be keen on addressing what determines

household alcohol participation and consumption behaviour. The analysis shows that both economic and socio-demographic variables are important determinants of alcohol consumption, thus policies should focus on these key variables. The programmes should therefore target groups that are more vulnerable. Such policies include the following:

- Develop twin strategies for complementary goods: Since smokers are more likely to consume alcohol than non-smokers, programmes targeting tobacco control should also include alcohol control. This would help in curbing health dangers arising from consumption of both tobacco and alcohol, given that both have detrimental health effects. Such strategies include total bans on alcohol advertising as it is the case with tobacco. Further, research has shown that increased exposure to alcohol through adverts increases the probability of non-alcohol drinkers drinking alcohol and existing drinkers drinkiing more.
- Incorporate gender in alcohol control planning: It is evident from the analysis that the alcoholism is mainly a male problem. This is mostly associated with the patriarchal system where households are mostly headed by males, who also control family resources. Alcohol control policies and campaigns should therefore put more emphasis on the males because they have higher risks of suffering from alcohol-related diseases arising from their heavy consumption compared to females.
- Develop specific messages for different income groups: High income earners drink more than low income counterparts, and this may be attributed to affordability. The poor are likely to drink low quality alcohol, which is affordable and should be educated more on the health dangers of poor quality alcohol, while high income earners should be made aware of the dangers of heavy episodic drinking (HED.
- Design regional-specific alcohol control campaigns: Alcohol consumption varies across different regions in the country in terms of the number of households using alcohol as well as the average expenditure on alcohol. Campaigns should be designed to tackle regional specific problems, and not necessarily blanket campaigns. For instance, the Rift Valley and Western regions should tackle the problem of traditional liquor more than the bottled beer, while Nairobi region should focus more on beer, wines and spirits.
- Impose a health tax on alcoholic drinks: In addition to the excise tax on alcoholic drinks, the government should introduce a health tax to help compensate the health externalities arising from alcohol consumption. The amount collected from the health tax should go directly to the health sector to facilitate treatment of alcohol-related diseases and injuries. This tax

would further increase prices of alcoholic drinks, and therefore discourage consumption.

However, alcohol taxation policies will only be effective for consumers whose level of disposable income does not increase. Policy tools should, therefore, focus both on prices and income of potential alcohol consumers. The taxes must be sizeable enough, and accompanied with tight measures to ensure that traders and consumers do not engage in illicit trade as a result. They should also be imposed on all types of alcoholic drinks, including traditional brew to ensure that consumers do not switch from the levied products to the non-levied ones.

## 5.3 Limitations of the Study

The study does not address the issue of alcohol prices and also the quantity and quality of alcohol consumed, but instead takes the total expenditure on alcohol as a measure of alcohol consumption. Information on prices would be important in addressing the issue of price elasticity as a determinant of alcohol consumption. There could be other factors that may influence the decision as to whether to consume alcohol or not and how much to consume, having made the decision to consume such as availability and religious beliefs.

The household is the unit of analysis, but alcohol consumption may only be done by a few household members. Individual level data may be able to give better estimates and, therefore, a clear understanding of the determinants of alcohol expenditure. The issue of self-reporting is also a challenge, where consumers of alcohol may report zero consumption.

The data on healthcare expenditure is too general and does not give the actual conditions that led to households incurring such expenditure. The consumption of alcohol as it is in the data cannot be grouped into the levels of alcohol consumption and this would be important in explaining health expenditure. Data with these details would help improve the analysis of the impact of alcohol consumption on healthcare expenditure.

## 5.4 Areas for Further Research

The fact that alcohol consumption was not an important determinant of household expenditure on health should not be taken to mean that there is no relationship between the two. An in-depth study targeting individuals consuming alcohol as opposed to households and detailed information on their health conditions as well as breakdown of the expenditure should be carried out to determine the relationship.

Since the data on health expenditure relates to the total expenditure, a breakdown of the specific conditions that were treated so as to incur the health expenditure is important so as to relate with the illnesses where alcohol is a risk factor.

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