Socio-Economic Determinants of Health Status of Households in Botswana

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ABSTRACT

Botswana’s health statistics show a tremendous decline in health status indicators over the years despite the increased annual budget allocation to the health sector for improved and preventive care. While other related studies carried out in the country and elsewhere have focused on the determinants of health status at the national level, this study captures the role of individual socioeconomic factors in determining health status in Botswana. The study uses a stratified sampling method to elicit information from 240 households in Gaborone, Botswana on their socioeconomic characteristics, as well as their health status within the last three months. Sampling was made in such a way that each stratum was age and gender representative. The Poisson Regression Model was used to analyze the information collected from the respondents. The empirical results show that the respondents’ age, marital status, employment duration, household size, health insurance ownership, monthly income, smoking and preventive health care spending significantly determine households’ health status in Botswana. This calls for specific policy interventions necessary for reversing deterioration in health status in Botswana.

JEL Classification: C01, C81, C87, D01, I10, I15

Keywords: Healthcare spending, health status; ill health; Poison Regression, health status determinants

1. INTRODUCTION

Botswana records an annual increase in total health care expenditure. Resources are used for the expansion of the exiting health care facilities, training of the health care personnel, health education and other health related projects. Figure 1 in the appendix shows total health care spending pattern from the year 1990 to 2009. However, despite the increased healthcare spending the country, health care indicators such as life expectancy at birth, under five mortality, general mortality, and morbidity rates show a significant deterioration in the health status of people over the years. The Republic of Botswana (2010) reports that over the past thirty years, there has been an increase in the under-five mortality rate and decreasing life expectancy. Life

The trends in ill health in Botswana indicate an increase in both non-communicable and infectious diseases, which still remain the most important causes of illness and death. As supported by the Republic of Botswana (2003), Botswana experienced an increase in malaria morbidity and mortality in the 1990’s with severe cases recorded in 1993, 1996 and 1997. The WHO Country Cooperation Strategy, Botswana (2008-2013) shows an increase in the number of Tuberculosis patients in the country has increased from 200 per 100 000 population between 1990 and 1994, to 620 per 100 000 population between 2001 and 2006 (Republic of Botswana, 2006). On the contrary, it is generally expected that a positive relationship exists between increased health care expenditure and improved health status indicators of a nation. Therefore, it remains imperative to understand the determinants of health status in Botswana so that appropriate policy interventions can be formulated. While other studies like Mmopelwa (2008), Gutema (2005), Akinkugbe (2004) and Cumper, (1984) have focused on the macro-level determinants of health status, this study uses the Poisson Regression Model to analyze the socioeconomic variables that determine health status at the household (micro) level, and draws policy recommendations necessary for reversing the deterioration in health status in Gaborone, Botswana.

The choice of Gaborone is based on the fact that it has a larger heterogeneous population and that it is the most industrialized part of the country. Ramsay (2000) emphasized that fundamental to rapid urbanization in Gaborone is the emergence of numerous industries in the city in the last decade. These include construction, food production, mechanical engineering and chemicals. In turn, the polluted environment affects the health and quality of life of the urban population. This problem is exacerbated by the high HIV incidence rate in Botswana.

2. PREVIOUS STUDIES

Studies have been undertaken in both developed and developing countries to ascertain the relationship between socio-economic variables and health status indicators at both national and household levels.

At the national research level, Turrel et al. (1999) stated that people with low socioeconomic status are less likely to prevent diseases, experience more ill-health and have higher mortality rates for most of the major causes of death in Australia than those with high socioeconomic status. Gakunju (2003) analyzed the determinants of health status indicators in Kenya. The estimated results suggest that per capita GDP, female literacy rate, public health expenditure, access to clean water, access to improved medical facilities and immunization coverage are positive and significant determinants of health status indicators. In another study, Akinkugbe (2004) showed that an increase in female literacy rate and health expenditure as a proportion of total government expenditure increase life expectancy at birth. In a similar study, Fayissa
and Gutema (2005) analyzed the determinants of health status in Sub-Sahara Africa using the Grossman (1972) model and Panel Regression analysis. The results indicated that an increase in literacy rates of countries and food availability are positively related to improvement in health status indicators. Greenidge and Stanford (2006) using a panel data estimation found out that the ratio of health expenditure to GDP, calorie intake, literacy rates and urbanization are positive determinants of health status in Latin American and Caribbean countries, while higher levels of carbon dioxide emissions lead to a deterioration in health status in the region. Mmopelwa (2008) found out that disease prevalence rates in Botswana positively increase with unemployment and negatively with an increase in number of health personnel. The study also showed that an inverse relationship exists between per capita government expenditure, school enrollment and the disease prevalence rates.

The above studies used national level secondary data to investigate the relationship between socioeconomic variables and health status indicators in both developing and developed countries. Other studies have investigated the socioeconomic determinants of health status by using primary data collected from households of differing socioeconomic characteristics. Martin and Kinsella (1994) reported that in the United States of America, more females report poor health status than their male counterparts, but that mortality is higher for males than females. However, Winston, Earl and Murphy (1993) found that the health status of a woman depends in part on the number of children she has given birth to. Ene-Obong, Enugu and Uwaregbute (2001) showed that education, age at marriage, age at first birth and income are strong and significant determinants of the health status of rural Nigerian women. An empirical study carried out by Kimhi (2002) concludes that literacy, wealth and satisfactory health facilities are positively related to improved health status among rural families in southern Ethiopia. The empirical analysis of Doctor (2006) explains that reported health status in rural Malawi is influenced by age, sex, type of house construction materials (proxy for wealth) and the region of residence of the respondent.

In summary, studies have shown that health status indicators are determined by social characteristics, which include gender, education, household size, age at marriage and first birth; economic status like income or wealth, and environmental factors like emissions, drinking water quality and

DATA, THEORETICAL FRAMEWORK AND MODELING PROCEDURE

This section discusses the data and model used in the study. It explains sampling methods, the nature and sources of data and description of variables. The section also briefly discusses the Poisson regression model used for data analysis.

2.1. Data Sources

The study made use of primary data collected in Gaborone. According to Tamasiga (2010), sample size depends on time constraint, financial constraint and heterogeneity of the population size that has to be covered. Therefore, the study used proportional stratified random sampling method to obtain the sample size of 240 respondents. Proportional stratified random method of sampling obtains a more representative sample than other methods and reduces sampling errors.
Stratified sampling results into estimators that correct bias and extracts maximum information from samples, (Manski and Lerman, 1997).

The stratification variables are income, gender and age. This is because people of different incomes, age groups and gender are assumed to have different health status. According to Grossman (1972) health stock depreciates with age. The CIAR (1989) further mentioned women to be more vulnerable to health risks and threats than their male counterparts. Higher income groups are associated with better health outcomes since they can afford to purchase health care.

Structured questionnaire was administered to 240 respondents by a face-to-face interview; with equal number from low, middle and high income households groups. Republic of Botswana (2006) categorizes households’ into the following income groups: From P0.00 to P1500 as low income; from P1501 to P8000 as middle income; and above P8001 as high income households. The interviewees were the heads of the households. Each income group consists of equal number of females and males.

2.2. The Empirical Model

According to Greene (2002), the Poisson regression model specifies that each $y_i$ which represents the number of times the event has occurred is drawn from a Poisson distribution with the parameter $\lambda_i$ which is related to the regressors $x_i$. Where $i = (1, ..., k)$

The primary equation of the model is given by;

$$
E(y_i | x_i) = \lambda_i = e^{x_i \beta_i} 
$$

Where

$y_i$ is the number of days of the incidence of illness

$x_i$ is a vector of independent variables such as age, gender, household size, marital status, schooling duration, employment duration, alcohol use, smoking, income and health insurance ownership, preventive and curative health care spending.

$\lambda_i$ is the parameter (the mean and also the variance).

$\mu_i$ is the disturbance term

The Poisson Regression model is adopted from Greene (2002). The most common formulation for $\lambda_i$ is the log linear model

$$
\ln \lambda_i = x_i \beta_i 
$$

It is shown that the expected number of days of the incidence of illness per period is given by

$$
E(y_i | x_i) = \text{var}(y_i, x_i) = \lambda_i = e^{x_i \beta_i} 
$$

This explains the changes in the conditional mean due to changes in the regressors with the equality of the conditional variance. This is one of the weaknesses of the Poisson model, where it is required that the mean is equal to the variance.
The standard estimator for this model is the **maximum likelihood estimator**. From equation (1), given the independence assumption, the log likelihood function is

\[
\ln L = \sum_{i=1}^{n} (-\lambda_i + y_i x_i \beta_i - \ln y_i !)
\]  

Equation (4) is obtained by applying logarithm to equation (1).

The **marginal effects** were used for the interpretation of the Poisson regression results. The marginal effect is given by

\[
\frac{\partial E(y | x)}{\partial x_i} = \frac{\partial \exp(x \beta)}{\partial x_i} \cdot \frac{\partial x \beta}{\partial x_i} = \exp(x \beta) \beta_i = E(y | x) \beta_i
\]

Equation 5 is obtained by differentiating the Poisson regression model (1) with respect to the regressors.

**2.3. Description and Definition of Variables**

This sub-section describes the variables that are used in the study and how they are measured.

**2.3.1. Dependent Variable**

The dependent variable is ill health measured by the number of days of the incidence of illness (individual morbidity) in the last three months. This is explained by the number of days when the respondents had some symptoms of illness and unable to perform their daily activities. The explained variable is count type data; hence, it is conformable to the use of Poisson Regression. While zero to two days of ill-health is considered to be excellent health status, six and more sick days in three months is considered to be poor health status.

**2.3.2. Independent Variables**

This comprises of the socioeconomic variables such as income, duration of employment, personal health care expenditure, education level, marital status, gender, age, household size, alcohol use and smoking.

*Income*

This is the average monthly disposable amount (in Pula) received by respondents either as paid remuneration for services rendered or from any income generating activities performed in a given period or both. It is expected that a positive relationship exists between the income level of an individual and the health status of that individual, because high income earners have the ability to pay for improved preventive and curative healthcare services.

*Insurance Ownership*

This is a dummy variable with ‘1’ when the respondent owns a health insurance policy or ‘0’ otherwise. There is an expected positive relationship between health insurance ownership and improved health status. Nketiah-Ampomah (2009) explained that access to healthcare financing,
through health insurance ownership, is crucial to meeting the health needs of individual households. This implies that households with health insurance are expected to be healthier than those without.

Preventive Health Care Expenditure

This study considers preventive healthcare expenditure as the amount spent on preventive medicines, physical fitness exercises and any activity that promotes good health. Preventive health care is expected to lessen the risk of infections; hence, leading to better health outcomes. On the other hand, curative health care is expected to influence health positively but not as excellent as preventive health care.

Education Level

This is measured as the number of years an individual has spent in a formal educational system prior to the interview. It is expected that a positive relationship exists between level of education and an individual’s health status. Grossman (1972) explains that the formally educated individuals are healthier, more conscious of personal and public health and engage in personal health promoting activities.

Marital Status

The marital status will be based on whether an individual is married or not. Marital status is treated as a dummy variable, with a value of ‘1’ when married and ‘0’ otherwise.

Gender

The gender of the respondent is treated as a dummy variable, with a value of ‘1’ when the respondent is a male and ‘0’ otherwise. If female respondents are healthier than their male counterparts, the sign of the estimated parameter will be negative. The converse is true for males been healthier than their female counterparts.

Age

This refers to the number of years the respondent has lived from the time of birth. The expected relationship between age and health is ambiguous. Grossman (1972) developed a health capital model which suggests that health stock depreciates with age. However, under-five are more prone to infant diseases than their older counterparts, but once adulthood has been attained the stock of health of the individual deteriorates with age.

Household Size

This is the number of people living under the same roof as a family. The sign is indeterminate. The dependency ratio of people who live in larger households with smaller incomes is higher than those who live in smaller household sizes. It is expected that larger households spend more on food, shelter and clothing than on health fitness activities, hence, respondents with small household sizes are expected be more healthier than those with large household sizes.
Alcohol Use

This variable is treated as a dummy, which takes the value of ‘1’ for respondents who drink alcohol and ‘0’ otherwise. It is expected that non-alcohol drinkers are healthier than those who drink alcohol. Therefore, a negative relationship is expected between alcohol drinking and improved health status.

Smoking

As with alcohol use, non-smokers are expected to be relatively healthier than their smoking counterparts. The variable is a binary dependent variable, with a value of ‘1’ for smokers and ‘0’ otherwise.

3. PRESENTATION OF RESULTS

This chapter provides the empirical findings and analysis of the socioeconomic determinants of individual health status in Gaborone, Botswana.

3.1. Descriptive Statistics

Table 1 presents the descriptive statistics of the variables used in the study.

The table shows an average of nine sick days, which ranges from ‘0’ to ‘60’ days. This implies that, on the average, the health status of individuals in Gaborone is poor.

The average monthly income of respondents is P6175, but it ranges from zero to P48000. With a standard deviation of P7571, it is evident that there is a great disparity in income distribution in the country.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description of variables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ill3</td>
<td>Number of days of incidence of illness in the past three months</td>
<td>8.89</td>
<td>18.92</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>Age</td>
<td>Age of the respondent (in years)</td>
<td>40.48</td>
<td>14.28</td>
<td>18</td>
<td>90</td>
</tr>
<tr>
<td>Gen</td>
<td>1 if male and 0 if female</td>
<td>0.5</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Inc</td>
<td>Monthly income (in pula)</td>
<td>6175.09</td>
<td>7571.28</td>
<td>0</td>
<td>48000</td>
</tr>
<tr>
<td>Mar</td>
<td>Marital status: 1 if married and 0 if unmarried</td>
<td>0.34</td>
<td>0.48</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sch</td>
<td>Education duration (in years)</td>
<td>11.22</td>
<td>5.44</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>Emp</td>
<td>Duration of employment (in years)</td>
<td>10.33</td>
<td>10.32</td>
<td>0</td>
<td>44</td>
</tr>
<tr>
<td>Alc</td>
<td>Alcohol consumption: 1 if taking alcohol and 0 otherwise</td>
<td>0.57</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Smk</td>
<td>Smoking habits: 1 if smoking and 0 otherwise</td>
<td>0.2</td>
<td>0.4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Ins</td>
<td>Health insurance ownership: 1 if insured and 0 if uninsured</td>
<td>0.51</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Prv</td>
<td>Preventive health care expenditure (in pula)</td>
<td>558.85</td>
<td>624.66</td>
<td>0</td>
<td>3700</td>
</tr>
</tbody>
</table>

Note: There are no missing values; all the variables have 240 observations.
Source: Author’s computations
The average age of household heads is 40 years, but it ranges from 18 to 90 years. Since the retirement age is 65 years, this average shows that the majority of those interviewed are expected to be in the working population.

The average household size of the respondents is 6 and the average individual expenditure on preventive health care is P559. The table shows that there are people who have never gone to school (represented by 0) and those who spent 22 years at school (the highest). On average, the heads of the households spent 11 years of schooling. This implies that the majority of the respondents have achieved at least senior secondary school level of education. The average duration of employment, but this ranges from those who have never worked to a maximum of 45 years in paid work.

Gender, marital status, alcohol consumption and smoking habits and health insurance ownership are dummy variables. From the results, there is an equal number of males and females respondents, from which 34 per cent and 66 per cent are married and unmarried, implying that the majority of the respondents are married. On the average, 57 per cent of the respondents drink alcoholic beverages and 20 per cent smoke cigarettes. The sample comprises of 51 per cent and 49 per cent of insured and uninsured, respectively.

3.2. Post-estimation Tests and Results of the Poisson Regression

Variance Inflation Factor and Breusch–Pagan Lagrange tests were used to test for multicollinearity and heteroscedasticity, respectively. Table 2 reveals none of the values of VIF of the variables is greater than 5 or 10. Therefore, we conclude that there is no severe problem of multicollinearity among the variables. Since the VIF is the strongest test for multicollinearity, we may conclude that multicollinearity is not a problem in the estimation of the models. Moreover, mean VIF of 1.88 depicts less severity of multicollinearity. Due to non-existence of the problem of multicollinearity among the independent variables, full Poisson model was estimated. None of the variables had to be dropped to correct for this problem.

The Breusch – Pagan Lagrange test for heteroscedasticity revealed no heteroscedasticity among the variables. The result drawn from test is as follows;
Null hypothesis: Constant variance (Homoscedasticity)

<table>
<thead>
<tr>
<th>Variables: fitted values of dependent variable</th>
<th>chi2(1) = 83.36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob &gt; chi2 = 0.0000</td>
<td></td>
</tr>
</tbody>
</table>

Since the calculated value (0.0000) is lower than the critical value (0.05), we fail to reject the null hypothesis of constant variance at 5 per cent significance level and conclude that the variables are homoscedastic. Thus, there is no problem of heteroscedasticity of the variables.

Differences in ill health could be due to socioeconomic factors such as age, gender, income, household size, marital status, employment duration, education level, alcohol use, smoking habits, insurance ownership and personal health care expenditure. To account for these differences we add these variables as independent variables:
Table 2 presents the results. The value of log likelihood at convergence is -2206.144. The pseudo $R^2$ explains the goodness of fit of the model. The pseudo $R^2$ of 0.2159 explains that about 22 per cent of the variation in ill health is explained by the independent variables. LR chi2(12) is the value of a likelihood-ratio chi-squared for the test of the null hypothesis that all of the coefficients associated with independent variables are simultaneously equal to zero, Long and Freeze (2001). Therefore, the likelihood ratio chi-square of 1214.93 with a p value of 0.00 shows that the model is significantly best fitted, as compared to an empty model.

| Coef. | IRR  | Std. Err | z-Score | P>|z| |
|-------|------|----------|---------|-----|
| Age 0.0257 | 1.026033 | 0.001881 | 13.66 | 0.00 |
| Gen 0.0630 | 1.065027 | 0.000498 | 12.65 | 0.00 |
| Inc -0.0732 | 0.929415 | 0.011349 | -6.45 | 0.00 |
| Hhz 0.0403 | 1.041123 | 0.006827 | 5.90 | 0.00 |
| Mar -0.1859 | 0.830357 | 0.050671 | -3.67 | 0.00 |
| Edu -0.0018 | 0.998202 | 0.005685 | -0.32 | 0.746 |
| Emp 0.0053 | 1.005314 | 0.002403 | 2.18 | 0.029 |
| Alc 0.0728 | 0.929787 | 0.035747 | 2.036 | 0.051 |
| Smk 0.4343 | 1.543882 | 0.059485 | 7.30 | 0.00 |
| Ins -0.2936 | 0.745575 | 0.062079 | -4.73 | 0.00 |
| Prv -0.0005 | 0.9995 | 7.22E-05 | -7.32 | 0.00 |
| _cons 1.0358 | 2.817359 | 0.116411 | 8.90 | 0.00 |

Number of obs = 240
LR chi2(12) = 1214.93
Prob > chi2 = 0.0000
Pseudo R2 = 0.2159

Source: Authors’ computations

According to Long and Freeze (2001), coefficients estimated by maximum likelihood can be tested with Wald test or likelihood ratio test. The choice of which test to use is often determined by convenience, personal preference, and convention within an area of research. This study will adopt the Wald test for hypothesis testing. We test the null hypothesis that all the coefficients except the intercept are simultaneously equal to zero. That is, we test the null hypothesis that the coefficients of age, gender, income, household size, marital status, education level, employment duration, alcohol use, smoking, insurance ownership and personal health care expenditure do not affect the probability of the number of days of the incidence of illness.

$$F(12, 227) = 3.16$$

Prob > F = 0.0003

Since the F–test probability value of 0.0003 (test statistic) is significant, we reject the null hypothesis of zero simultaneous coefficients and conclude that the effects of age, gender, income, household size, marital status, education level, employment duration, alcohol use, smoking, health insurance ownership and personal health care expenditure have a significant influence on the probability of the number of days of the incidence of illness.
The maximum likelihood model (Table 2) shows that all the variables except education are significant. These variables are significant at 10 per cent level. The confidence interval of 90 per cent is used in this study because the data is cross sectional. There is a positive relationship between ill health and age, household size, employment duration, alcohol use and smoking. However, a negative relationship exists between ill health and income, marital status, health insurance ownership and preventive health care expenditure.

The reduced form model consists of only the significant variable, which is given in equation 6

\[
\ln(ill3) = 1.0358 + 0.0257\text{age} + 0.063\text{gend} - 0.0732\text{inc} + 0.0403\text{hhz} - 0.1859\text{mar} + 0.0053\text{emp} \\
+ 0.0728\text{alc} + 0.4343\text{smk} - 0.2936\text{ins} - 0.005\text{prv}
\]

(6)

The following interpretations are based on the reduced form model in equations 6 and 7:

### 3.2.1. Interpretation of the Coefficients

Equation 6 presents the results of the Poisson regression for the significant variables. The coefficients are presented in Column 2 of Table 2. The coefficients explain the difference in the log of falling ill for a unit change in the independent variable, assuming that all the other independent variables are held constant.

Similarly, the Poisson regression can be interpreted as the Incidence Rate Ratio (IRR). That is the change in the rate of falling ill for a unit change in the independent variable, assuming that all the other variables in the model are held constant. This is calculated by the exponentiation of the coefficients given in Column 2 of Table 2. The IRR is reported in Column 3 of Table 2. The following are the interpretations of the individual significant independent variables:

#### Age

From Table 2, it is shown that the difference in the log of falling ill increases by 0.02571 when age increases by one year. In terms of IRR, the incidence of falling ill increases by 1.026 times when age increases by one year, while holding all the other variables constant. This implies that increase in age increases the likelihood of falling ill.

#### Gender

The gender variable is a dummy. The estimated coefficient compares males to females assuming that the other variables are held constant in the model. The difference in the log of expected counts of falling ill is expected to be 0.063 higher for men than for women. Similarly, comparing males to females, the estimated IRR shows men are 1.065 times more likely to fall ill than women. These two figures show that males are more likely to fall ill than females.
Income
The income coefficient is positive. The Poisson regression coefficient shows that the difference in the log of expected counts of falling ill would be expected decrease by 0.0732 when income increases by P1.0 and the IRR indicates that on the average, the incidence of falling ill decreases 0.929 times when income increases by P1.0, holding the other variables constant. This implies that the likelihood of falling ill declines with increase in income.

Household Size
With a unit increase in household size, the difference in the logs of the expected counts of falling ill increases by 0.04 if all the other variables remain constant, and the incidence of falling ill increases 1.04 times when the size of the household increases by an additional member.

Marital Status
This is a dummy variable. The estimated coefficient compares married to unmarried respondents assuming that the other variables are held constant. The coefficient explains that the difference in the logs of expected counts of falling ill is expected to be 0.1859 lower for married respondents than their unmarried counterparts, and the corresponding IRR shows that for married respondents, compared to the unmarried ones, have an incidence rate of falling of 0.83 times than their married counterparts.

Duration of Employment
The sign of the duration of employment is positive, implying that staying in employment increases the likelihood of falling ill. The coefficient of 0.0053 indicates that the difference in the logs of falling ill increases by 0.0053 when the respondent has an additional year of working experience. The corresponding IRR shows that the incidence of falling ill increases 1.0053 times when working experience increases by 1 year.

Alcohol
The estimated Poisson coefficient for the variable compares alcohol users to non-alcohol users, given that the other variables are constant. The coefficient indicates that the difference between the logs of expected counts of falling ill is expected to be 0.0728 higher for alcohol users than for the non-alcohol users if all the other factors are held constant. The corresponding IRR indicates that alcohol users have an incidence rate of falling ill of 0.93 times higher compared the non-alcohol users. This implies that drinking alcohol increases the likelihood of falling ill.

Smoking
The coefficient has a positive sign, and the difference in the logs of expected counts of falling ill is expected to be 0.4343 higher for smokers than for non-smokers. Also the IRR coefficient indicates that smokers have an incidence rate of falling ill of 1.5439 times higher than the non-smokers; hence, smoking increases the likelihood of falling ill.
Insurance

The Poisson coefficient is negative, indicating that the ownership of insurance decreases the number of counts of falling ill. The difference in the logs of expected counts of falling ill is expected to be 0.2936 higher for smokers than for non-smokers. The IRR coefficient shows that insurance owners have an incidence rate of falling ill of 0.7456 times less than those who do not own insurance, assuming that all the other variables are held constant.

Preventive Care Expenditure

The coefficient is negative, implying that increase in preventive care expenditure decreases the likelihood of falling ill. The estimated Poisson regression coefficient shows that when preventive care expenditure increases by P1.00 the difference in the logs expected counts of falling ill decreases by 0.0005. Similarly, the estimated IRR indicates, that on the average, when the respondent’s expenditure on preventive care increases by P1.00, holding all the other variables constant, the rate ratio of falling ill would be expected to decrease 0.9995 times.

3.3. Marginal Effects

The marginal effects show how the probabilities of each outcome change with respect to changes in regressors. The marginal effects vary depending on the values of the independent variables. Consequently, we choose the mean as the baseline for the independent and dependent variables. Therefore, for one unit increase in the independent variable from the baseline, the probability of an event is expected to increase/decrease by the magnitude of the marginal change holding other variables constant. This study provides an interpretation of only significant variables. These variables are age, income, household size, marital status, employment duration, smoking insurance ownership, and personal health care expenditure.

| variable | dy/dx | Std.Err. | Z   | P>|z| | X       |
|----------|-------|----------|-----|------|---------|
| age      | 0.171788 | 0.01275  | 13.48 | 0.000 | 40.475  |
| Gender   | 0.004128 | 0.30747  | 0.010 | 0.989 | 0.3417  |
| Income   | -0.00033 | 0.00005  | -6.600 | 0.000 | 6175.1  |
| Hhsizen  | 0.269261 | 0.04550  | 5.920 | 0.000 | 6175.1  |
| Marital  | -1.20851 | 0.32143  | -3.760 | 0.000 | 0.3417  |
| School   | -0.01232 | 0.03803  | -0.320 | 0.746 | 0.3417  |
| Employ   | 0.035102 | 0.01599  | 2.200 | 0.028 | 10.333  |
| Alcol    | -0.48962 | 0.37693  | -1.300 | 0.194 | 0.5708  |
| Smokn    | 3.328342 | 0.51980  | 6.400 | 0.000 | 0.5083  |
| Insure   | -1.97487 | 0.42090  | -4.690 | 0.000 | 0.5083  |
| Prevnt   | -0.003537 | 0.00047  | -7.520 | 0.000 | 558.85  |

Source: Author’s computations (*) dy/dx is for discrete change of dummy variable from 0 to 1
Y = predicted number of events (predict)
= 6.6870665
Interpretation of Socio Economic Variables

Age is found to be a significant determinant of health status in Gaborone. This variable is positively associated with the number of days of the incidence of illness at five per cent significance level, while controlling for other variables. An additional year of life of respondents from the baseline of 40 years increases the probability of the number of days of the incidence of illness by 17.2 per cent. The results indicate that, if we hold the other independent variables, older people are more likely to frequently fall sick than their younger counterparts. This possible reason for this that older people are more prone to diseases than younger ones since their immune system weakens with age.

Income is another significant determinant of health status. The results show that an increase in income decreases the probability ill health. That is, an additional pula from the baseline of P6175.09 decreases the probability of falling sick by 0.03 per cent, holding other variables constant. Therefore, people who earn more than P6175.09 afford better medical health care insurance, spend more on preventive and curative health care and have higher health status than those who earn below the average amount of income.

Household size is negatively associated with health status. An additional household member from the household size of 6 increases the probability of the number of ill days of the respondent by 26.9 per cent, holding other variables constant. According to the results, an increase in household size increases the risks of the head of the household’s ill days. Heads of smaller household sizes take care of a lesser numbers of individuals than heads larger households. Therefore, heads of smaller households are more likely to report better health status due to less stress and less dependency ratio.

Marital status positively associates with health. The discrete change of marital status from unmarried to married is found to reduce the probability of the number of days of the incidence of illness. The married spend less number of ill days as compared to those who are not. This might be because married people have, more material resources, less stress, indulge in less risky behavior and have more social support, (Slogget and Cheung, 1998).

Employment duration is found to be a significant determinant, but negatively associated with health status. An additional year of employment from the average of 10 years of work experience is found to increase the number of ill days by 3.5 per cent. People who spend many years of work are more likely to have more ill days than those who do not. This could come as a result of work related stress which may result into illness symptoms. Long employment duration implies more hours of work and more stress factors which offset possible beneficial effects of employment duration on health.

Smoking is significant and increases the number of days of the incidence of illness. Discrete change from non-smoking to smoking increases the probability of ill days. This is in accordance with a priori expectation. Those who smoke are expected to have poor health than their non-smoker counterparts, hence increasing their number of days spent ill. Smokers are more likely to develop lung related symptoms, hence leading to low health status.

As expected, insurance ownership positively influences health status. The discrete change from uninsured to insured decreases the probability of the number of days of incidence of
illness. People with medical/health insurances have access to better medical/health care at lower costs than those who are not insured. Therefore, they pay frequent visits to health care centers than those without medical insurance. O’Connor (2006) explained that persons without insurance are more likely to delay seeking medical care, are less likely to fill prescriptions and only as half likely to follow through on treatment. Moreover, the uninsured persons are less likely to engage in preventive health care so early detection is not possible.

Personal health care expenditure is considerable at 10 per cent significant level. Spending on preventive health care from the baseline of P559 increases the probability of ill days of the heads of the households by 0.35 per cent, holding other variables constant. Individual spending on curative health care utilize health care since they are ill and have to lessen the symptoms, but those who are not ill may purchase health care, not necessarily meaning they will utilize it.

4. SUMMARY AND CONCLUSIONS AND POLICY RECOMMENDATIONS

The study investigated the determinants of health status in Gaborone, Botswana using socioeconomic factors as determinants of health status. The results obtained from Poisson regression model suggest that ownership of health insurance, married household heads, higher income and curative health care spending significantly influence improved health status, while age, household size, smoking, extended work experience lead to a significant deterioration in health status.

The above empirical findings have plausible health policy implications. The following are recommended policies for public and private consideration.

(i) Given that household size significantly influences health status, there is the need to launch public campaigns on family health improvement initiatives, include Family Life Education (FLE) in secondary schools curriculum. This improve the population’s knowledge on how to improve family health.

(ii) Because smoking adversely affects health status, there is the need to ban, and enforce the ban on smoking in public places, and launch anti-smoking campaigns at national level at the work place, schools and institutions of higher learning. This will discourage smoking and reduce passive smoking for non-smokers. Because, smoking habits begin in primary and secondary schools, children in these institutions should be educated on the adverse consequences on smoking on future health status. People should be informed about the dangers of passive smoking. Cigarettes producers should be advised not to make their packaging look attractive since they tempt people to buy and use them.

(iii) Also, the Government of Botswana, through the Ministry of Labour and Industrial Relations should formulate and implement policies that favour improved work related health issues of their employees. The risks associated with employment and tactics to control these risks should be considered. Since long employment duration is found to increase the risk of ill health days, there should be regulations on the weekly and monthly hours of work and early retirement. Employees should have longer in-work rest breaks during their working times. The government should further protect the workers by providing minimum period of rest.
(iv) Insurance ownership is a significant determinant of improved health status. That is those who own health insurance have improved health statuses than those without health insurance. People, of low socioeconomic status should be made aware of the importance of health insurance. Health insurance companies should cater for people with low incomes, and that such companies should be encouraged and expanded in Botswana.

(v) There is the need to encourage preventive health measures, like physical exercises, and nutrition education. Medical insurance companies should consider either reimbursing their clients’ expenditure on exercises that promote good health. The public should be made aware of healthy foods and good eating habits.

References


Appendix

Figure 1: Trend in Total Health Spending (1990 – 2009)

Source: Authors calculation with the data obtained from the WHO.

Note: Total health care spending comprises of private households’ 'out of pocket payment’, non profit institutions serving households (NGOs), prepaid and risk pooling plans, other government and the Ministry of Health.
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