



Socio-Economic Determinants Of Cigarette Consumption In Lesotho: A Gender Perspective

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Abstract

This paper analyses the socio-economic determinants of cigarette consumption in Lesotho, with a special focus on differentials in smoking participation between male and female populations. To execute its objective, the paper employed binary logistic regression and individual data from the 2018 Multiple Indicator Cluster Survey. Binary logistic regression is a class of regression conducted when the dependent variable in a regression model is discrete, taking on two or more possible values. The results indicate that adult men were less likely to smoke cigarettes compared to male youth, furthermore, adult women were more likely to smoke cigarettes compared to female youth, on the other hand, men with higher education were less likely to smoke cigarettes compared to those with primary or no education, while women with secondary education were less likely to use cigarette than those who had primary or no education. Moreover, men living in Maseru and Leribe districts were significantly more likely to consume cigarettes than men from any other district in Lesotho.

Keywords

Gender, Cigarette Consumption, Binary Logistic Regression, Socio-economic Determinants

JEL Classification: L53, L66, M31, M38

Introduction

Cigarette consumption is a global epidemic and a leading cause of premature deaths that are otherwise preventable (Wang *et al.*, 2018). Since the early 1960s, many researchers from across the world have presented overwhelming evidence about the danger of smoking on human health (Goodchild *et al.*, 2017). The evidence shows that smoking and cigarette use has been associated with numerous cancers and chronic illnesses that include lung cancer in men and women, laryngeal cancer in men, and chronic respiratory and coronary heart diseases in men and women (USDOHS *et al.*, 2014). The World Health Organisation (WHO) estimates that there are over 8 million global tobacco-related deaths annually (WHO, 2020). Tobacco-related illnesses and deaths cost the global economy an estimated US\$1436 billion annually and about 40 percent of the cost is incurred by low- and middle-income countries (Goodchild *et al.*, 2017). According to Drope *et al.*, (2018), 942 million men and 175 million women in the world use tobacco. Dickson and Ahinkorah (2017) indicate that in recent years, low and middle-income countries have been experiencing growing rates of cigarette use, smoking-induced illnesses and deaths.

There are numerous explanations that people give for smoking cigarettes. However, some studies have reported that there is a strong inverse association between cigarette consumption and the socioeconomic status of an individual, with people of lower socioeconomic status being more inclined to smoke than those of higher socioeconomic status (Jitnarin *et al.*, 2011). Therefore, thorough investigations are needed to understand the factors that contribute to the growing rates of cigarette use in low and middle-income countries.

Lesotho is a small developing country that is completely landlocked by the Republic of South Africa. The total population of Lesotho as of the 2016 census was 2,007,201 million, where males make up 48.9 percent while females are 51.1 percent of the total population (BoS¹, 2018). The population distribution by age shows that 31.8 percent of Basotho are aged below 15 years old while 31.1 percent are aged 15-64 years old and 6.1 percent are aged 65 years and above. According to WHO (2019), the combined life expectancy of Basotho is 55.65 years, whereas females' life expectancy is higher than males at 58.90 years and males at 52.52 years. In Lesotho, cigarette consumption has been of great concern. However, there is a disparity in smoking prevalence between males and females. Forty-one percent of males and only 0.3 of females between the ages of 15 to 49 of Basotho²

¹ Bureau of Statistics of Lesotho

² This is a plural word referring to more than one person who is a citizen of Lesotho

who smokes a cigarette (BoS, 2016). Males’ cigarette consumption is highest at 53 percent between the ages of 25 to 49 compared to 19 percent prevalence between the ages of 15 to 19 (BoS, 2016). Carnaham (2013), estimated the prevalence and consumption of tobacco by age and sex in 103 countries globally and identified the average number of cigarette sticks smoked by a Mosotho³ male per day in different age groups as shown in the table1.1 below.

Table 1.1: Average number of cigarette sticks smoked by a Mosotho male per day

Age groups	The average number of cigarette sticks smoked per day
15-24 years	4.3 sticks
25-34 years	5.4 sticks
35-44 years	5.8 sticks
45-54 years	5.6 sticks
55-69 years	5.3 sticks
70+ years	4.4 sticks

Source: Carnaham (2013).

No data show the daily cigarette use by women and youth. However, the evidence shows that the prevalence of cigarette consumption is only 1 percent among young women aged 15-19 years and 25 percent among older women aged group 45-49 years (BoS, 2018).

Smoking prevalence also varies by place of residence and education level in Lesotho. For example, BoS (2018) indicated that cigarette smoking prevalence was 43 percent among men residing in rural areas and 38 percent for men residing in urban areas. Furthermore, the BoS (2018) report showed that there was a 66 percent and 23 percent smoking prevalence among men and women, respectively, with no primary education but reported a lower prevalence of 24 percent and 1 percent among men and women, respectively, who had attained education beyond secondary school level.

Cigarette use has long been identified as a global public health risk that causes suffering and socio-economic problems in human beings (Dickson and Ahinkorah, 2017). According to Magitta (2018), 70 percent of the total mortalities that occurred in sub-Sahara Africa between the years 1990 and 2016 were associated with smoking; also the problem is compounded by global trends which show that 12 percent of youth around the world are exposed to second-hand smoking and face the risk of contracting smoking-related illnesses. In Lesotho, the increase in the use of cigarettes is an issue of great concern (BoS, 2016). Increasing statistics of cigarette consumption pose a serious challenge of adding to the increase of the already high rate of non-communicable diseases such as cancer and cardiovascular diseases among the population (Drope et.al, 2018). The BoS (2016) indicates that the use of tobacco among men has increased by 7 percent (from 35 percent to 42 percent) between 2009 and 2014, while the use of tobacco

³ This is a singular word referring to one person who is a citizen of Lesotho.

among women has marginally decreased by one percent (from 9 percent to 8 percent) between 2009 and 2014. Among men who consume tobacco, the majority, 41 percent, use cigarette while only 0.3 percent of women who use tobacco smoke cigarettes. Evidence also shows that cigarette smoking prevalence is generally high among the Basotho population aged between 25 to 49 years old (BoS, 2018). This means that cigarette has a high potential of depriving Lesotho of its workforce that contributes to the economy through smoking-related illnesses and deaths if not abated. The question this study intends to address is 'what are the factors that contribute to cigarette smoking among men and women in Lesotho?'

The annual death toll caused by tobacco-related fatalities in Lesotho is 2500 and these deaths are, on average, 11.31 percent and 3.66 percent higher for men and women, respectively than in any other Low-Human Development Index (HDI) country (Drope et. al., 2018). As pointed out by WHO (2020), half of those who smoke die from tobacco-related illnesses, as a result, given this state of affairs in Lesotho, it becomes critically important to investigate and understand factors that drive cigarette use to tackle the cigarette smoking problem before it reaches crisis level where the country will be incurring greater health and economic losses. The literature has exposed the scale of the problem posed by cigarette consumption and the negative effects it has on the direct smokers and the bystanders in the form of second-hand smoking. Gaining an understanding of the socio-economic determinants of cigarette consumption in Lesotho will arm the policymakers with evidence-based information that will assist in formulating appropriate policies that would reduce the demand for a cigarette, hence the adverse effects associated with its use among Basotho. In addition, it is crucial to carry out this study because there is no existing literature that studied the socio-economic determinants of cigarette consumption using individual data in Lesotho. Therefore, this study contributes to the existing literature by investigating the elements that drive cigarette consumption among men and women in Lesotho.

The main objective of this study is to analyse the socio-economic determinants of cigarette consumption in Lesotho, with a special focus on differentials in smoking participation between males and females. Specifically, the study seeks to; Identify the socio-economic and demographic determinants of cigarette consumption, and to ascertain the difference between male and female participants of cigarette smoking in Lesotho. A wealth of empirical literature exists on studies about the socioeconomic determinants of cigarette smoking that have been carried out the world over (Nketiah-Mponsah, 2018). However, in Lesotho, only a few studies have been conducted in this area and are limited in scope. For example, Zee and Walbeek (2019) analysed the effect of increases in tobacco taxes on tobacco smuggling and illicit trade in Lesotho; Dickson and Ahinkorah (2017) examined the relationship between tobacco use and socio-economic inequalities among men in Lesotho; while Moshoeshoe (2012) studied the Consumer demand for alcoholic beverages and tobacco in Lesotho. These studies did not focus attention on the socio-economic factors that contribute to cigarette consumption

among men and women in Lesotho, which is what this study is investigating.

In 2004, the country signed and ratified the World Health Organisation Framework Convention on Tobacco Control (WHO FCTC). But there remains no law or policy that prohibits smoking in public places, advertisement of tobacco and tobacco products, packaging and labelling, minimum age restrictions and sale of tobacco products. There has not been any effort to implement the FCTC to control tobacco in Lesotho. According to the World Bank (2017), the government of Lesotho is intending to impose a levy on tobacco and alcohol products as an effort to combat their harmful effects. As the country is now planning to implement tobacco control measures, there is a need for evidence-based research that will inform the policy process in the country. There is a gap in the literature regarding the empirical evidence on factors that drive cigarette consumption in Lesotho. Therefore, this study intends to fill that gap by providing empirical evidence about the socio-economic factors that influence cigarette consumption in the country, because the cigarette companies are increasingly seeing Africa as a potential market for their products due to its slow progress toward regulating the sale of cigarette products.

Empirical Literature

Smoking is the global leading cause of preventable deaths (Blecher and Ross, 2013). Due to this problem, researchers in different parts of the world have devoted a huge amount of research to investigating factors that drive cigarette demand throughout the world to provide advice to policymakers about the preventative measures that would curb high cigarette consumption. An example of such studies is one conducted in the United States by Doogan *et al.*, (2017) titled a growing geographic disparity: rural and urban cigarette smoking trends in the United States, whose main objective was to observe the differences in cigarette consumption trends between rural and urban residents in the United States.

Doogan *et al.*, (2017) used two-part regression models to analyze annual cross-sectional data from the National Survey on Drug Use and Health from 2007 through 2014 to observe differences in cigarette consumption trends between rural and urban residents in the United States. Having adjusted for psychosocial and demographic characteristics of both urban and rural populations in the models, the results showed that the rural adult population was more likely to smoke than their urban counterparts. Furthermore, the results showed that trends in smoking prevalence among urban dwellers fell at a faster pace than a fall in rural smoking prevalence. Ngaruiya *et al.*, (2018) also employed the Logistic regression model to analyze the cross-sectional household survey obtained from the National Bureau of Statistics of Kenya to determine the impact of the socio-demographic factors (age, sex, level of education, wealth quintile, and residence) on the prevalence and frequency of smoking in Kenya. The results showed that out of the total respondents in the sample under study, smoking prevalence was 13.5 percent, and 83.8 percent of the smokers in the sample were males. The results further showed

that 77.4 percent of the smokers were under the age of 50 and the average age of smoking initiation was 21 years. Moreover, the findings indicated that 71.7 percent of smokers had only ever attended primary school.

Guliani *et al.*, (2019) analyzed 2011 and 2016 DHS data for Ethiopia collected by the Ethiopia Central Statistical Agency using a two-level random intercept logistic model to study the determinants of tobacco smoking in Ethiopia. Moreover, Guliani *et al.*, (2019) found that; men had a higher likelihood to smoke than women, older adults (40–49) were nine times more likely to smoke tobacco than the younger age groups (15–19), divorced individuals and those with unskilled manual occupations were more likely to smoke tobacco compared to their counterparts, individuals with higher education were 44 percent less likely to smoke tobacco, Individuals from the bottom wealth quintile are 1.5 times more likely to smoke tobacco than those from the richest quintile (the reference category), and finally, the results showed that urban dwellers were more likely to smoke tobacco than rural residents. A similar study was done by Colwell *et al.*, (2020), who studied social determinants of tobacco use in the Democratic Republic of the Congo through the analysis of Demographics and Health Survey (DHS) data using the logistic regressions model. The results of the study showed that smoking prevalence was high among people with less education, low literacy and the working poor. However, the results indicated that smoking prevalence was low among people who were working as professionals, technicians or holding a managerial positions.

Yaya and Bishwajit (2019) analyzed Data from the Demographic and Health Surveys using multivariate regression methods to assess the prevalence of tobacco consumption among adolescent and adult men in Zambia and Zimbabwe. The findings of the study showed that there was a 20 percent smoking prevalence among men in the age group of 15-54 years in Zambia and Zimbabwe, furthermore, the smoking prevalence was higher among those aged between 25-39 years in both countries. Ayo-Yusuf and Omole (2020) carried out a study in South Africa to examine the relationship between nicotine dependence, socioeconomic status, lifestyle behaviours and lifetime quit attempts among adult smokers. Ayo-Yusuf and Omole (2020) used the Heaviness of Smoking Index (HSI) to analyse data obtained from the South African Social Attitude Survey and found that the prevalence of smoking was 20.1 percent, of this males accounted for 31.6 percent and females 9.5 percent, and the prevalence was 37 percent among people with the mixed-ancestry. Further, the results indicated that 14.5 percent of smokers had high nicotine dependence, with a higher proportion being people in the high socioeconomic status group. Similarly, Pedro *et al.*, (2017) studied the prevalence of tobacco consumption and nicotine dependence among smokers in Angola.

Using the PostgreSQL and SPSS statistical software to analyze data obtained from the Health and Demographic Surveillance System, the findings showed that smoking prevalence increased with age, and was higher in rural areas and among individuals with no formal education and who had lower incomes. Tingum *et al.*, (2017) carried out a study on Tanzania using Demographic Health Survey data,

logit and multinomial logistic regression models to assess the socio-economic determinants of tobacco consumption. The results of the study indicated factors that influenced tobacco consumption among male smokers to be age, urban residence, no education, primary, poorest, poor and never married, while factors associated with tobacco use among females were found to be age, no education, primary, poorest, poor, unemployed and being an unskilled and domestic employer were significantly associated with female tobacco use. Chisha *et al.*, (2019) carried out a study on Namibia, using Demographic and Health Survey data and concentration index to evaluate the socio-economic inequalities in cigarette smoking. The results showed that smoking prevalence and intensity were higher among wealthy Namibians compared to those who were poor.

Mbongwe *et al.*, (2017) analyzed primary data using the Logistic regression models to investigate the prevalence and risk factors for smoking among students aged 12–18 years in Botswana. The results showed that smoking prevalence among students was at 10 percent and that female student were at a higher risk of exposure to smoking by peers and family and access to tobacco products than their male counterparts. A similar study by Kabwama *et al.*, (2016) assessed the prevalence of daily tobacco use and associated risk factors using weighted logistic regression and Uganda's nationwide NCD risk factor survey data. The results showed that smoking prevalence was 10 percent in Uganda; furthermore, the results revealed that people who were older, male, had no formal education, resided in the east, north and western regions and were underweight, were significantly associated with daily tobacco consumption.

Bonnechère *et al.*, (2019) evaluated the prevalence of tobacco smoking in Burkina Faso using Data from the 2013 Burkina Faso World Health Organization Stepwise approach to Surveillance and logistic regression for analysis. The results of the study revealed that the prevalence of tobacco use in Burkina Faso was 19.8 percent and that tobacco use was higher among men at 29.2 percent than among women at 11.8 percent. The results further indicated that smoking among men was significantly associated with an increased age while smoking was significantly associated with age, education and residence among women.

Kusumawardani *et al.*, (2018) undertook research where they used the Logit regression model to analyze data from the 2013 Indonesian Basic Health Research survey to measure the cigarette smoking prevalence among Indonesian adolescents and to determine the socio-economic, demographic and geographic factors that drove the cigarette demand among Indonesian adolescents. The results from the study showed that cigarette smoking prevalence was higher among male and lower among female adolescents. The findings further revealed that cigarette smoking prevalence was lower among adolescents with the lowest level of education and increased with increasing education levels, moreover cigarette smoking prevalence was high among adolescents from poorer families and low among those from rich families. On the other hand, the results showed that cigarette smoking prevalence was the same among adolescents who lived in rural and urban settlements.

Finally, Nketiah-Amponsah *et al.*, (2018) undertook a study to investigate the determinants of cigarette smoking and smoking intensity among adult males in Ghana using the 2014 Ghana Demographic and Health Survey. The results showed that men with lower socioeconomic status had a higher likelihood to smoke a cigarette than those with higher socioeconomic status. Further, the results showed that among men who smoke, those who were between the ages of 44 and 60 and have acquired at least a primary education were more likely to smoke at a greater intensity on the daily basis.

The studies reviewed above show that socio-economic factors have a strong influence on cigarette consumption. Studies focusing on the socio-economic determinants of cigarette consumption have significant relevance for the current study by providing a piece of empirical evidence on which to base the findings. In Lesotho, compared to other countries, little attention has been paid to socioeconomic factors that drive cigarette consumption. Even though Dickson and Ahinkorah (2017) conducted a study using the 2014 Demographic and health survey on socio-economic inequalities and cigarette smoking in Lesotho and Ghana, the authors focused attention on socio-economic determinants of all forms of tobacco only on men. The authors did not focus attention on socio-economic determinants of smoking and also on women and youth. Seemingly, not much has been done to explore the socio-economic factors that determine cigarette consumption among men and women in Lesotho. Therefore, this study is intended to address the gap wherein there is limited research which examines the socio-economic determinants of cigarette consumption among men and women in Lesotho.

Methodology

The data used in this analysis is obtained from the Multiple Indicator Cluster Survey (MICS). (BoS, 2019). The survey collected data on males and females separately. A sample of 10, 413 households were selected where 6, 453 women and 2, 873 males were interviewed. The response rate was 89.7 percent for females and 84.1 percent for males. The sample was representative and data was collected from all 10 districts of Lesotho across all 4 ecological zones: Lowlands, Foothills, Mountains and Senqu River Valley using a systematic sampling procedure (BoS, 2019). The data include information on the socio-economic characteristics of men and women from age 15 to 49 years old and information on cigarette use for both sexes. However, the MICS 2018 survey did not collect data on the prices of cigarettes. Figure 3.1 in the appendices shows the maps of Lesotho with districts and ecological zones. The 10 districts are; Butha-Buthe, Leribe, Berea, Maseru, Mafeteng, Mochale's Hoek, Quthing, Mokhotlong, Thaba-Tseka and Qacha's Nek. The four ecological zones are; Lowlands, Foothills, Mountains and Senqu River Valley.

The Theoretical Model

In a binary response model, interest lies primarily in the response probability

$$P(y = 1 | \mathbf{x}) = P(y = 1 | x_1, x_2, \dots, x_k) \quad (3.4.1)$$

Where we use \mathbf{x} to denote the full set of explanatory variables. For example, when y is an employment indicator, \mathbf{x} might contain various individual characteristics such as education, age, marital status, and other factors that affect employment status, including a binary indicator variable for participation in a recent job training program.

Specifying the Logit Model

Consider a class of binary response models of the form
 $P(y = 1 | \mathbf{x}) = G(\beta_0 + \beta_1 x_1 + \dots + \beta_k x_k) = G(\beta_0 + \mathbf{x}\boldsymbol{\beta})$, (3.4.2)

Where G is a function taking on values strictly between zero and one: $0 < G(z) < 1$, for all real numbers z . This ensures that the estimated response probabilities are strictly between zero and one. We, therefore, write

$$\mathbf{x}\boldsymbol{\beta} = \beta_1 x_1 + \dots + \beta_k x_k. \quad (3.4.3)$$

Various nonlinear functions have been suggested for function G to make sure that the probabilities are between zero and one. In the logit model, G is the logistic function:

$$G(z) = \exp(z) / [1 + \exp(z)] = \Lambda(z). \quad (3.4.4)$$

Which is between zero and one for all real numbers z . This is the cumulative distribution function for a standard logistic random variable. In the probit model, G is the standard normal cumulative distribution function (cdf), which is expressed as an integral:

$$G(z) = \Phi(z) \equiv \int_{-\infty}^z \phi(v) dv \quad (3.4.5)$$

Where $\phi(z)$ is the standard normal density
 $\phi(z) = (2\pi)^{-1/2} \exp\left(-\frac{z^2}{2}\right)$... (3.4.6)

This choice of G again ensures that (3.4.2) is strictly between zero and one for all values of the parameters and the x_j .

The G functions in (3.4.4) and (3.4.5) are both increasing functions. Each increases most quickly at $z = 0$, $G(z) \rightarrow 0$ as $z \rightarrow -\infty$, and $G(z) \rightarrow 1$ as $z \rightarrow \infty$. The logit model can be derived from an underlying latent variable model. Let y^* be an unobserved, or latent, variable, and suppose that

$$y^* = \beta_0 + \mathbf{x}\boldsymbol{\beta} + e, \quad y = 1[y^* > 0], \quad (3.4.7)$$

Where we introduce the notation $1[\cdot]$ to define a binary outcome. The function $1[\cdot]$ is called the indicator function, which takes on the value one if the event in brackets is true and zero otherwise.

Therefore, y is one if $y^* > 0$, and y is zero if $y^* \leq 0$. We assume that e is independent of \mathbf{x} and that e either has the standard logistic distribution or the standard normal distribution. In either case, e is symmetrically distributed about zero, which means that $1 - G(-z) = G(z)$ for all real numbers z .

From (3.4.7) and the assumptions are given, we can derive the response probability for y :

$$\begin{aligned} P(y = 1 | \mathbf{x}) &= P(y^* > 0 | \mathbf{x}) = P[e > -(\beta_0 + \mathbf{x}\boldsymbol{\beta}) | \mathbf{x}] \\ &= 1 - G[-(\beta_0 + \mathbf{x}\boldsymbol{\beta})] = G(\beta_0 + \mathbf{x}\boldsymbol{\beta}), \end{aligned} \quad (3.4.8)$$

The primary goal of binary response models is to explain the effects of the x_j on the response probability $P(y = 1 | \mathbf{x})$ (3.4.9)

In the logit models, the direction of the effect of x_j on $E(y^* | \mathbf{x}) = \beta_0 + \mathbf{x}\boldsymbol{\beta}$

and on $E(y | x) = P(y = 1 | x) = G(\beta_0 + \mathbf{x}\beta)$ is always the same. For most purposes, we want to estimate the effect of x_j on the probability of success $P(y = 1 | x)$, but this is complicated by the nonlinear nature of $G(\cdot)$. To find the partial effect of roughly continuous variables on the response probability, we must rely on calculus. If x_j is a roughly continuous variable, its partial effect on $p(x) = P(y = 1 |$

$$\frac{\partial p(x)}{\partial x_j} = g(\beta_0 + \mathbf{x}\beta)\beta_j, \text{ Where } g(z) \equiv \frac{dG}{dz}(z). \quad (3.4.10)$$

Because G is the cumulative density function (cdf) of a continuous random variable, g is a probability density function. In the logit case, $G(\cdot)$ is a strictly increasing cdf, and so $g(z) > 0$ for all z . Therefore, the partial effect of x_j on $p(\mathbf{x})$ depends on \mathbf{x} through the positive quantity $g(\beta_0 + \mathbf{x}\beta)$, which means that the partial effect always has the same sign as β_j . Equation (17.7) shows that the *relative* effects of any two continuous explanatory variables do not depend on \mathbf{x} : the ratio of the partial effects for x_j and x_h is β_j/β_h . In the typical case that g is a symmetric density of about zero, with a unique mode at zero, the largest effect occurs when $\beta_0 + \mathbf{x}\beta = 0$. For example, in the probit case with $g(z) = \phi(z)$, $g(0) = \phi(0) = 1/\sqrt{2\pi} \approx .40$. In the logit case, $g(z) = \exp(z)/[1 + \exp(z)]^2$, and so $g(0) = .25$. If, say, x_1 is a binary explanatory variable, then the partial effect from changing x_1 from zero to one, holding all other variables fixed, is simply

$$G(\beta_0 + \beta_1 + \beta_2x_2 + \dots + \beta_kx_k) - G(\beta_0 + \beta_2x_2 + \dots + \beta_kx_k) \quad (3.4.11)$$

Again, this depends on all the values of the other x s. For example, if y is an employment indicator and x_1 is a dummy variable indicating participation in a job training program, then (3.4.11) is the change in the probability of employment due to the job training program; this depends on other characteristics that affect employability, such as education and experience. Note that knowing the sign of β_1 is sufficient for determining whether the program had a positive or negative effect. But to find the magnitude of the effect, we have to estimate the quantity in (3.4.11). If x_k denotes this variable, then the effect on the probability of x_k going from c_k to $c_k + 1$ is simply

$$G[\beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_k(c_k + 1)] - G(\beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_kc_k). \quad (3.4.12)$$

When measuring the effects of discrete variables, regardless of how complicated the model is, we should use (3.4.12) (Wooldridge, 2012).

Model Specification

The method employed to carry out the econometric analysis in this study is similar to that used by Sahan *et al.*, (2018). The study makes use of binary logistic regression to model the relationship between cigarette use and socio-economic factors in Lesotho. The empirical binary logit regression model is specified as follows; it will be estimated separately for men and women.

$$\text{Smokes}_i = \beta_0 + \beta_1 \text{Age category}_i + \beta_2 \text{Education category}_i + \beta_3 \text{Wealth category}_i + \beta_4 \text{Marital status}_i + \beta_5 \text{Residence area}_i + \beta_6 \text{District}_i + \varepsilon_i \quad (3.5.1)$$

The binary dependent variable is specified as follows:

$$\text{Where } \text{Smokes}_i = \begin{cases} 1 & \text{if smokes} \\ 0 & \text{otherwise} \end{cases}$$

The variables in the empirical model are explained as follows

Smokes_i is the dependent variable which is a binary outcome indicating whether a person smokes a cigarette or not.

Age: It is a categorical variable with two categories: youth are people aged (15-35) years and adults are people aged (36-49) years. These categories are based on the definition by Lesotho's Ministry of Gender, Youth, Sports and Recreation, where youth are classified as persons aged 15 to 35 years and adults are classified as persons aged 36 years old and above (Lesotho Population and Housing Census, 2016). Pedro et al., (2017) found that smoking prevalence increase with age. That is young people are less likely to smoke while older people are more likely to smoke a cigarette

Education: It is a categorical variable that is divided into 3 categories; no education or primary, secondary and higher education. People with a lower level of education are more exposed to smoking than those with a higher level of education (Tingum et al., 2017).

Wealth: Wealth is a categorical variable containing the wealth index of individuals classified as poor, middle income and high income. However, for each category, a dummy variable is generated to capture each category's effect on smoking participation. The poorest category is used as the base category. According to Guliani et al., (2019), poor people are more likely to smoke a cigarette than their wealthy counterparts. Although unemployment was not considered in this study due to a lack of data, unemployed people are assumed to have been represented under the poor category within the wealth variable. Alvarez et al., (2020) assert that tobacco may no longer exhibit characteristics of a normal good (of being procyclical towards the business cycle) as a result of regulations imposed on its consumption by countries in a quest to curb its use. On the other hand, Bossols and Castello(2016), claim that variation in the economic cycle will have an income effect, where people will decrease consumption of drugs due to a fall in income and a counter-cyclical effect where people will increase consumption of drugs as a response to stress that resulted from the loss of employment and increased leisure hours that are as a result of redundancy.

Marital status: This is a dummy variable specifying whether an individual is married or not married. All the other categories such as separated, divorced and widowed are assigned 0. People with marital statuses other than married are more likely to report that they are currently smoking cigarettes than those who are married (Ramsey et al., 2019).

Residence area: This is a dummy variable indicating whether a person lives in an urban or rural. Urban dwellers are more likely to smoke than rural residents (Guliani et al., 2019).

Districts: There are 10 districts in Lesotho, and they are Butha-Buthe, Leribe, Berea, Maseru, Mafeteng, Mohale's Hoek, Quthing, Qacha's Nek, Mokhotlong and Thaba-Tseka

Religion is not included in the analysis because it was not part of the data collection. However, it could have been useful to examine how religion would impact the use of cigarettes as one of the determinants of its use.

Results and Discussions

This section presents descriptive statistics and the regression results of the logistic model, which include the odds ratios and the marginal effects. The mean ages of the men and women were 28.3(SD 9.8) years and 29.1(SD 9.8) years respectively. Referring to Table 1 below, the majority of men (73.6 percent) and women (72.1 percent) were in the youth (15-35years) age groups and the least was in the adult (36-49 years) age groups. Approximately half of the men obtained primary or no education (44.9 percent), while 42.9 percent and 12.2 percent obtained a secondary education and higher education respectively. On the other hand, more than half of the women (56.2 percent) obtained secondary education, and 30.6 percent obtained primary or no education; while 13.2 percent obtained higher education. A larger number of the men (41.8 percent) and the females (41.6 percent) are in the middle-income wealth index quintile, 36.5 percent of men and 30.7 percent of females were in the poor wealth index quintile while 21.7 percent of men and 27.6 percent of females were in the high-income wealth index quintile. The majority of the male participants (53.3 percent) were not married, while the majority of the female participants (66 percent) were married. The population samples showed that the majority of the participants resided in rural areas, where 58.7 percent of men and 52.5 percent of females were reported to be living in the rural areas of Lesotho. The classification of the place of residence according to the districts, on the other hand, indicated that the distribution of the male participants in the sample was as follows: Butha-Buthe (5.74 percent), Leribe (14.64 percent), Berea (12.95 percent), Maseru (33.02 percent), Mafeteng (9.21 percent), Mochale's Hoek (6.76 percent), Quthing (3.43 percent), Qacha's Nek (3.18 percent), Mokhotlong (5.09 percent) and Thaba-Tseka (5.98 percent); while sample distribution of female participants was: Butha-Buthe (5.1 percent), Leribe (16.39 percent), Berea (12.9 percent), Maseru (33.09 percent), Mafeteng (8.77 percent), Mochale's Hoek (7.1 percent), Quthing (4.04 percent), Qacha's Nek (2.79 percent), Mokhotlong (4.36 percent) and Thaba-Tseka (5.46 percent).

The statistics showed that there was a higher participation rate in Maseru, Leribe and Berea districts, compared to all other districts, where the sample sizes were well above 10 percent of the population in each district. The cigarette smoking prevalence showed a stark smoking difference between men and women in the samples. Table 1 shows that the smoking prevalence among men in the sample was 66.9 percent while female smoking prevalence was only 13.6 percent. The differentials in smoking prevalence between males and females lead to rejecting the second null hypothesis which states that the smoking prevalence between males and females is the same in Lesotho.

Table 4.1: Distribution of the basic characteristics of the study population by gender

Demographic and socioeconomic characteristics	men		women	
	n	%	n	%
Age				
Youth(15-35 years)	2113	73.55	4,655	72.14
Adults(36-49 years)	760	26.45	1,798	27.86
Education				
Primary or None	1290	44.89	1,975	30.61
Secondary	1233	42.9	3,626	56.19
Higher	351	12.21	851	13.19
Wealth Index Quintile				
Poor	1049	36.51	1,983	30.73
Middle Income	1201	41.82	2,686	41.63
High Income	623	21.67	1,783	27.64
Marital Status				
Not Married	1531	53.33	2,197	34.05
Married	1339	46.67	4,256	65.95
Area of Residence				
Rural	1687	58.72	3,391	52.54
Urban	1186	41.28	3,062	47.46
Districts				
Botha-Bothe	165	5.74	329	5.1
Leribe	420	14.64	1,057	16.39
Berea	372	12.95	832	12.9
Maseru	949	33.02	2,135	33.09
Mafeteng	264	9.21	566	8.77
Mohales Hoek	194	6.76	458	7.1
Quthing	99	3.43	261	4.04
Qachas Nek	91	3.18	180	2.79
Mokhotlong	146	5.09	281	4.36
Thaba-Tseka	172	5.98	353	5.46
Prevalence				
No	514	35.02	195	86.44
Yes	954	64.98	31	13.56

Source: Authors' computation

The regression results are the output of the logistic regression model specified in equation 3.5.1, where the model is estimated separately for men and women. The results of the marginal effects are also presented to capture the magnitude of a change in the smoking participation of men and women of Lesotho concerning the socio-economic status of the participants in the sample.

The Odds Ratios

The odd ratios for the socio-economic factors for both men and women are shown in Table 4.6. For cigarette consumption among men, a negative relationship exists with age, whereby adult men were 9.6 percent less likely to smoke cigarettes compared to male youth. Conversely, for cigarette consumption among women, a positive relationship exists with age, where adult women were 112.5 percent (OR = 2.125) percent more likely to smoke cigarettes compared to female youth.

The regression results showed that adult men in Lesotho (36-49 years old) are less likely to use cigarettes than younger adults (15-35 years old). This is similar to the findings made by Hou *et al.*, (2015). However, the regression results for females showed that adult women were more likely to use cigarettes than younger women, which contradicts the findings from their male counterparts. The

age categories used in this study are similar to those recommended by the government of Lesotho (BoS, 2016).

For cigarette consumption among men, a negative relationship exists with educational attainment, whereby men who obtained secondary education were 28 percent less likely to smoke cigarettes compared to those who had primary or no education. Furthermore, men with higher education were 48 percent less likely to smoke cigarettes compared to those with primary or no education. On the other hand, the results showed that a negative relationship exists for women between the use of cigarettes and educational attainment. Women with secondary education were 72 percent less likely to use cigarettes than those who had primary or no education.

For education, the regression results showed that the use of cigarettes was lower among both men and women with secondary education and higher educational attainment, as is seen in Sahan *et al.*, (2018) and Alam *et al.*, (2008). According to Pampel, (2008), the inverse relationship between educational attainment and cigarette consumption could be a result of the ability of educated individuals to read and understand about dangers associated with cigarette use. The lower educated population of the society is vulnerable to potential dangers of cigarette use which could in turn pose a serious threat to public health as the number of cigarette-related illnesses raise potential (Alam *et al.*, 2008).

Based on the wealth index, men in the middle-income category were 3 percent less likely to use cigarettes than men in the poor-income category. Furthermore, men in the higher income category were 5 percent less likely to consume cigarettes than those in the poor income category. However, these relationships were not statistically significant. On the other hand, women in the middle-income category were found to be 7 percent more likely to use cigarettes than those in the poor-income category. However, women in the high-income category are 67 percent less likely to smoke a cigarette than those in the poor-income category. These relationships between wealth index and cigarette consumption among women were also not statistically significant.

For the wealth index category, there was lower cigarette consumption prevalence among men in the middle- and high-income categories, and women in the high-income category. This was consistent with the findings made by Hou *et al.*, (2015) and Tingum *et al.*, (2017). However, cigarette consumption among women in the middle-income category was higher than those in the poor-income category. This outcome contradicts earlier findings, for example, Garrett *et al.*, (2019) discovered that cigarette prevalence was higher among poorer communities in the United States. Though not statistically significant, these results provide an important indication of the relationship between income levels and cigarette use in Lesotho. Concerning marital status, the results showed that cigarette consumption by unmarried men was lower than by married men. On the contrary, the results showed that cigarette consumption by unmarried women was higher than that of married women. However, these relationships were not statistically significant. The consumption of cigarettes was lower among unmarried men and higher among unmarried women. Unmarried men were 15 percent

less likely to smoke compared to married men, while unmarried women consumed more cigarettes (OR=1.143) compared to married women.

For cigarette use and marital status, there was a lower cigarette use among men who were not married than those who were married. This was similar to findings by Tingum *et al.*, (2017). Conversely, cigarette consumption was high among unmarried women than their married counterparts, and this was consistent with the results reported by Owolabi *et al.*, (2017).

The regression results showed that men living in the rural areas of Lesotho were more likely to use cigarettes than those living in urban areas. This is similar to the findings reported in Pampel, (2005). However, cigarette consumption among Basotho women living in rural areas was lower compared to those living in urban areas. The contradicting results could be a result of cultural influences as noted by Owolabi *et al.*, (2017). Generally, smoking is socially acceptable among men compared to women as observed in the majority of South African and Indian communities (Chhabra *et al.*, 2019).

For cigarette consumption per district, no clear-cut relationship existed between cigarette consumption among men, while the results showed that women smoked less in all the districts. However, these relationships were not statistically significant for women. The results further showed that men who lived in the Leribe and Maseru districts were more likely to smoke cigarettes (OR=2.01 and OR=1.46 respectively). The results indicate that men who lived in Qacha's Nek, Mokhotlong and Thaba-Tseka districts smoked less.

Table 4.2: Odds ratios of the cigarette use vs. socio-economic factors of men and women in Lesotho

Characteristic	men			Women		
	Odds Ratio	95% CI	P-value	Odds Ratio	95% CI	P-value
Age						
Youth(15-35 years)	1.000	1.000	1.000	1.000	1.000	1.000
Adults(36-49 years)	0.904	(0.660 -1.240)	0.533	2.125	(0.428 -10.552)	0.357
Education						
Primary or None	1.00	1.00	1.00	1.00	1.00	1.00
Secondary	0.723	(0.528 - 0.989)	0.043	0.278	(0.069 - 1.126)	0.073
Higher	0.520	(0.303 - 0.893)	0.018	0.274	(0.021 - 3.656)	0.327
Wealth Index Quintile						
Poor	1.000	1.000	1.000	1.000	1.000	1.000
Middle Income	0.972	(0.707 -1.335)	0.859	1.073	(0.252 - 4.559)	0.924
High Income	0.949	(0.602 -1.496)	0.821	0.331	(0.024 - 4.564)	0.409
Marital Status						
Not Married	0.854	(0.631 -1.156)	0.307	1.143	(0.327 -3.994)	0.834
Married	1.000	1.000	1.000	1.000	1.000	1.000
Area of Residence						
Rural	1.126	(0.821 -1.545)	0.462	0.595	(0.162 - 2.188)	0.435
Urban	1.000	1.000	1.000	1.000	1.000	1.000
Districts						
Botha-Bothe	1.000	1.000	1.000	1.000	1.000	1.000
Leribe	2.013	(1.222 -3.317)	0.006	0.436	(0.041 - 4.610)	0.491
Berea	1.106	(0.691 -1.769)	0.674	0.658	(0.072 - 6.028)	0.711
Maseru	1.457	(0.933 -2.273)	0.098	0.782	(0.105 -5.842)	0.811
Mafeteng	1.098	(0.691 -1.746)	0.692	0.455	(0.048 - 4.305)	0.492
Mohales Hoek	1.258	(0.758 -2.090)	0.374	0.519	(0.043 - 6.251)	0.605
Quthing	1.068	(0.613 -1.860)	0.816	1.802	(0.219 - 14.822)	0.584
Qachas Nek	0.957	(0.574 -1.596)	0.866	0.686	(0.076 - 6.217)	0.738
Mokhotlong	0.901	(0.529 -1.536)	0.702	1.000	n/a	n/a
Thaba-Tseka	0.735	(0.444 - 1.217)	0.231	0.379	(0.009 - 16.042)	0.612
Constant	1.891	(1.173 -3.048)	0.009	0.981	(0.120 - 8.797)	1.027

Source: Authors' computation

The Marginal Effects

Marginal effects measure how one variable, the dependent variable, changes as a result of a change in another variable, the independent variable while holding all other variables constant. The results for the marginal effects for both men and women are presented in Table 4.2. The results showed that men in the adult age group were associated with a 0.023 decrease in the number of cigarettes consumed. This finding is consistent with the discovery made by Tingum *et al.*, (2017). When investigating the determinants of tobacco use in Tanzania, Tingum *et al.*, (2017) found that the likelihood of smoking first increased and then decreased as age increased. On the other hand, women in the adult age group were associated with a 0.122 increase in the number of cigarettes consumed. Ngaruiya *et al.*, (2018) also found that smoking increased with age, with older people being more likely to smoke than youth.

For cigarette consumption among men, a negative relationship exists with educational attainment. The results revealed that an additional year in secondary school was associated with a 0.07 decrease in the number of cigarettes consumed among men. Also, an additional year in higher education was associated with a 0.15 decrease in the consumption of cigarettes among men. On the other hand, an additional year in secondary school and higher education among women was associated with a decrease in cigarette use among women. These results are consistent with the findings made by Muyinza *et al.*, (2020, who found that people with higher education in Zambia had lower chances to smoke.

The results show a decrease in cigarette consumption among men in the middle-income and high-income categories. These results are similar to the findings by Guliani *et al.*, (2019) who found that poorer individuals were more likely to smoke than the rich in Ethiopia. However, there was an increase in cigarette consumption among women in both the middle-income and high-income categories. In support of this finding, Yaya *et al.*, (2017) discovered that in terms of wealth index, a consistently higher wealth index was associated with higher odds of an individual being a smoker in Malawi.

A decrease in cigarette consumption was discovered among unmarried men. Being unmarried and being a man was associated with a 0.036 decrease in cigarette consumption. However, the results indicated that unmarried females were associated with an increase of 0.014 increase in cigarette consumption. The results for women are consistent with the findings made by Magati *et al.*, (2018) who found that married women in Kenya were the least likely to smoke.

Men living in rural areas of Lesotho were associated with a 0.028 increase in cigarette consumption. Doogan *et al.*, (2017), also found that smoking prevalence was higher in rural America than in urban areas. Women living in rural areas, however, were associated with a 0.048 decrease in cigarette consumption. This means that women who live in urban areas are more like to smoke than those living in rural areas. Similar results were found by Chisha *et al.*, (2019), who

discovered that smoking was positively associated with living in the urban area. Pampel (2008) has also found the smoking prevalence to be high among uneducated urban dwellers in Malawi and Zambia. Cigarette consumption among men in most districts shows an increasing trend except for those men who lived in Qacha’s Nek, Mokhotlong and Thaba-Tseka districts. For example, men who lived in Leribe and Maseru districts were associated with a 0.15 and 0.09 increase in the number of cigarettes consumed, respectively, holding all other factors constant. However, cigarette consumption showed a decreasing trend among women in all the districts.

Table 4.3: Marginal effects of the cigarette use vs. socio-economic factors of men and women in Lesotho

Characteristic	men			
	Odds Ratio	95% CI	P-value	Odds Ratio
Age				
Youth(15-35 years)	1.000	1.000	1.000	1.000
Adults(36-49 years)	0.904	(0.660 -1.240)	0.533	2.125
Education				
Primary or None	1.00	1.00	1.00	1.00
Secondary	0.723	(0.528 - 0 .989)	0.043	0.278
Higher	0.520	(0.303 - 0.893)	0.018	0.274
Wealth Index Quintile				
Poor	1.000	1.000	1.000	1.000
Middle Income	0.972	(0.707 -1.335)	0.859	1.073
High Income	0.949	(0.602 -1.496)	0.821	0.331
Marital Status				
Not Married	0.854	(0.631 -1.156)	0.307	1.143
Married	1.000	1.000	1.000	1.000
Area of Residence				
Rural	1.126	(0.821 -1.545)	0.462	0.595
Urban	1.000	1.000	1.000	1.000
Districts				
Botha-Bothe	1.000	1.000	1.000	1.000
Leribe	2.013	(1.222 -3.317)	0.006	0.436
Berea	1.106	(0.691 -1.769)	0.674	0.658
Maseru	1.457	(0.933 -2.273)	0.098	0.782
Mafeteng	1.098	(0.691 -1.746)	0.692	0.455
Mohales Hoek	1.258	(0.758 -2.090)	0.374	0.519
Quthing	1.068	(0.613 -1.860)	0.816	1.802
Qachas Nek	0.957	(0.574 -1.596)	0.866	0.686
Mokhotlong	0.901	(0.529 -1.536)	0.702	1.000

Source: Authors’ computation

This chapter has presented the descriptive statistics and estimation analyses to achieve the study objectives. The first objective investigated the socio-economic and demographic factors that influence individuals’ cigarette consumption in Lesotho. This was achieved through the use of the logit model. Results from the model revealed that cigarette consumption decreased with age in men but

increased with age in women. The results also showed that a higher level of education was associated with low cigarette consumption in both males and females; also richer men were less likely to consume cigarettes than poorer ones while richer women were more likely to consume cigarettes than poorer women. Furthermore, the results indicated that unmarried men were less likely to consume cigarettes than married men while unmarried women were more likely to consume cigarettes than married women. Cigarette consumption according to the place of the residence revealed that men living in rural areas were more like to consume cigarettes than those lying in urban while women living in urban areas were more like to consume cigarettes than those living in rural areas. The results further showed that men living in Maseru and Leribe districts were significantly more likely to consume cigarettes.

Conclusion and Recommendations

This study investigated the relationship between socio-economic factors and cigarette use among men and women in Lesotho. Even though this study has provided an understanding of cigarette consumption among men and women in Lesotho, there were variations in how each socio-economic variable influences cigarette consumption. The results showed that there was a significant relationship between some of the socio-economic variables and cigarette consumption. The study revealed that the odds of cigarette consumption were low among men and women with secondary education, high-education and the high-income group. There was also a high prevalence of cigarette consumption among men who reside in rural areas, the Maseru and Leribe districts. Furthermore, the odds of cigarette use were high among women in the adult age group and middle-income group as well as unmarried women. Therefore, these factors are essential for reflection to provide evidence-based public health interventions to curb cigarette consumption in Lesotho. However, cigarette prevalence was low among men in the adult age group, men in the middle-income group, unmarried men and women who lived in rural areas.

The evidence provided by this study indicates that there is a significant inverse association between cigarette use and men who obtained both secondary and higher education. The results further showed that men who live in the Leribe district have a significantly higher likelihood to consume cigarettes than men from all other districts. Considering these results, this study recommends that secondary education be made free and compulsory as is the case with primary education. This will increase the population of people with secondary education and will then impact negatively cigarette consumption. Lekhetho (2013) notes that the introduction of free primary education in the year 2000 has significantly improved enrolment in primary schools. The government should also invest in making available warning messages and engage in awareness campaigns especially in the Leribe district to educate the public about the dangers that are associated with consuming cigarettes.

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