Prevalence and Socioeconomic Determinants of Tobacco Consumption Patterns across Urban and Rural Settings in Cameroon

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Abstract: Background: Tobacco consumption is an established risk factor for non-communicable diseases (NCDs). Tobacco consumption also increases the risk of suffering from serious symptoms due to COVID-19 illness. Controlling tobacco consumption is one of the “best buys” to reduce the burden of non-communicable diseases (NCDs) and COVID-19 in the world where tobacco is the single most preventable cause of death. By the year 2030, it is projected that some 70% of tobacco deaths will be in low-income and middle-income countries. Like other African countries, Cameroon faces the greatest threat in terms of future growth in the consumption of both smoking and smokeless tobacco. This study aims at determining the prevalence ratios, the geographical distribution and the socioeconomic determinants of smoking and smokeless tobacco consumption by gender in Cameroon. Methods: This study uses secondary data of 2011 Cameroon Demographic and Health Survey to analyze both smoking tobacco and smokeless tobacco consumption, stratified by gender and residence (urban/rural). Variables were extracted on tobacco among households and individuals using STATA-15 and Microsoft Excel 2016. Multivariate logistic regression models were conducted to evaluate the relationship between gender-based tobacco consumption and residence (urban/rural), age, marital status, education, wealth quintile, and ethnic group. Results: A total number of 22,617 responses on tobacco consumption were recorded, 50.4% from urban settlement and 68.2% of females. Mean age of tobacco consumption was 29.8 years. Overall, the prevalence of smoking tobacco was 5.3%, with higher prevalence in rural settlement (3.1%) and among males (15.3%) than in urban settlement (2.1%) and among females (0.5%); while the prevalence of smokeless tobacco was 1.3%, with 0.9% in rural settlement and 2.7% for males, and 0.3% in urban settlement and 0.6% for females. However, the analysis stratified by residence shows that tobacco is almost exclusively consumed by large proportions of men in both urban (12.23% for smoking tobacco and 1.52% for smokeless tobacco) and rural (19.15% for smoking tobacco and 3.94% for smokeless tobacco). In urban settlement, the prevalence of smoked tobacco increases as the level of education increases with 0.62% for uneducated women and 1.67% for women in higher education, while the prevalence of smokeless tobacco decreases as the level of education increases with 0.63% for uneducated women and 0% for women in higher education. The highest prevalence of smoked tobacco was found among secondary educated men with 20.7% nationwide with 15.3% and 23.5% among urban and rural men respectively. The low prevalence of smoked tobacco was found among no preschool men with 10.5%. The prevalence of smoked tobacco was high among the poorer (second quintile) women and men for both smoked and smokeless tobacco with 1.02% and 1.46% for women and 18.48% and 7.61% for men. The dual consumption was high in the middle class with 0.06% for women among the poorer (second quintile) men with 2.17%. Indeed, socioeconomic factors such as age, marital status, education level, and wealth quintiles significantly influence the consumption of smoked and smokeless tobacco among men and women in both urban and rural settlements. These tobacco consumption patterns are a reflection of the different production and market distribution for smokeless and smoking tobacco in Cameroon. Conclusions: Distinct geography by urban and rural, gender and socioeconomic distribution of tobacco consumption patterns are explored in order to begin the understanding of the tobacco epidemic environment in Cameroon.

Key words: Prevalence, socioeconomic, tobacco consumption, determinants, gender, urban, rural, Cameroon.
1. Introduction

The prevalence of tobacco consumption varies widely between high and low income countries worldwide. The highest prevalence of tobacco consumption has previously been found in high-income countries, with 37% prevalence among men and 25% among women [1, 2]. Tobacco consumption in any form is one of the leading causes of death globally, with around 8 million people (roughly 22,000 persons a day) who died from a tobacco-related disease in 2017 [2]. By 2030, it is projected that tobacco consumption will produce the highest burden of premature mortality and disability in the world compared to other health risk factors with low and middle income countries being more affected with about 70% of tobacco deaths than high income countries [3-6]. In Africa, estimations suggest that deaths from smoking-attributed causes reach 5-7% for men and 1-2% for women [7]. These rates are projected to become higher in the future. Studies of tobacco consumption by socioeconomic status (SES) in African nations have found that cigarette use is the highest among urban men and women who are less educated and economically disadvantaged and both tobacco smoking and smokeless tobacco consumption is much more common across gender and socioeconomic status [1, 5, 7]. Thus, many socioeconomic factors are known to influence the prevalence of tobacco consumption, from socio-demographic individual level factors such as gender, education, age, income level, to country-level geographic factors such as urban versus rural environment and national implementation of tobacco control policies [5, 8-10].

Nowadays, there is evidence that tobacco consumption has some relationship with the global Coronavirus or COVID-19 health crisis worldwide. Indeed, tobacco consumption may increase the risk of suffering from serious symptoms due to COVID-19 illness. The early research evidence indicates that, compared to non-smokers, having a history of smoking may substantially increase the chance of adverse health outcomes for COVID-19 patients, including being admitted to intensive care, requiring mechanical ventilation and suffering severe health consequences [11, 12]. The effects of smoking on the respiratory system make it more likely that smokers contract these diseases, which could be more severe and smoking is also associated with increased development of acute respiratory distress syndrome, a key complication for severe cases of COVID-19, among people with severe respiratory infections [13]. Evidence from China, where COVID-19 originated, shows that people who have cardiovascular and respiratory conditions caused by tobacco consumption, or otherwise, are at higher risk of developing severe COVID-19 symptoms [14]. Research on 55,924 laboratories confirmed cases shows that the crude fatality rate for COVID-19 patients is much higher among those with tobacco related cardiovascular disease, diabetes, hypertension, chronic respiratory disease or cancer than those with no pre-existing chronic medical conditions, thereby demonstrating that these pre-existing conditions may increase the vulnerability of such individuals to COVID-19 [13, 15]. Moreover, there is an increased risk of more serious symptoms and death among COVID-19 patients who have underlying conditions, including several tobacco related diseases and this may have implications for smokers given that the virus that causes COVID-19 primarily affects the respiratory system often causing mild to severe respiratory damage [13, 16], which could result in fatality. There is also evidence that COVID-19 patients that have more severe symptoms often have heart-related complications [17]. This relationship between COVID-19 and cardiovascular health is important because tobacco consumption and exposure to

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second-hand smoke are major causes of cardiovascular diseases worldwide [18]. The effect of COVID-19 on the cardiovascular system could thus make pre-existing cardiovascular conditions worse and a weaker cardiovascular system among COVID-19 patients with a history of tobacco consumption could make such patients more vulnerable to severe symptoms, thereby increasing the risk for those patients [13, 18, 19]. People who consume any form of tobacco products may still be more likely to catch the COVID-19 due to the habit of smoking, which involves bringing their hands very close to their face and smokers who contract COVID-19 are more likely to end up in intensive care than non-smokers with the virus. However, given that COVID-19 is a newly identified disease, the link between tobacco consumption and the disease needs further documentation and research. However, unless urgent action is taken, tobacco could kill one billion people during the 21st century [21]. Tobacco is the single most preventable cause of death in the world. Attempts to control tobacco consumption led to the adoption of the World Health Organization Framework Convention on Tobacco Control (FCTC) [20]. Cameroon actively participated in the negotiations of the WHO Framework Convention on Tobacco Control (FCTC) and in 2004 was one of the first waves of countries to ratify the treaty.

Like other African countries, Cameroon, with a population of about 25 million people, is in the early stages of the tobacco epidemic. Though according to WHO [21] the current tobacco consumption (both smoking and smokeless) rates among people of 15 years old and above 2018 estimates show the crude adjusted prevalence for both sexes of 8.8% (male: 16.6% and female: 1.1%). The age-standardised prevalence for both sexes is about 9.3% (male: 17.5% and female: 1.2%). In addition, the current tobacco smoking rates among people of 15 years old and above 2018 estimates indicated the crude adjusted prevalence for both sexes of 7.1% (male: 13.9% and female: 0.3%) and the age-standardised prevalence for both sexes of 7.5% (male: 14.8% and female: 0.3%). However, the prevalence of tobacco smoking among young people is about 14%, while the number of people exposed to tobacco smoke evolved from 35.7% in 1994 to about 37% in 2010 [8]. However, prevalence and its socioeconomic conditions have received little if any attention in the expanding field of tobacco research in Cameroon. In a country where public health system is under-funded and ill-equipped to address the disproportionate burden of tobacco-related diseases, robust evidence on socioeconomic determinants is needed to understand the behavioural risk factor among Cameroon populations. This study aims at determining the prevalence and socioeconomic determinants of tobacco consumption in Cameroon, so as to proffer recommendations for future interventions. The findings of this paper will provide the theoretical and empirical information that will be contextually relevant, accessible and useable by tobacco control advocates, policymakers and the general public to understand better the relationship between tobacco consumption and socioeconomic determinants for policy changes in favour of incorporating tobacco control into the development agenda in Cameroon.

2. Methods

This study uses secondary data of population-level based on Cameroon Demographic and Health Survey and Multiple Indicator Cluster Survey (CDHS-MICS) 2011 dataset to analyze the prevalence and socioeconomic determinants of both smoking tobacco and smokeless tobacco consumption, stratified by gender and residence (urban/rural). CDHS-MICS 2011 data were obtained from the United State Agency for International Development (USAID) through online registration and formal application for the dataset. Additional permission was sought from the Ministry of Public Health and the National Institute of Statistics, Cameroon.
Cameroon Demographic Health Survey mostly contained questions on maternal and child health issues, but it also collected information on tobacco consumption. This survey was conducted with a nationally representative household survey that interviewed 15,060 households sampled across all the ten regions in Cameroon. The study included a total sample size of 22,617 individuals from 400 clusters in Cameroon. The sample size was broken down as follows: 11,398 in urban areas (7,772 women and 3,626 men) and 11,219 in rural areas (7,654 women and 3,565 men). The 15,426 women in the sample were between 15-49 years of age, while the 7,191 men in the sample were between 15-59 years of age. The CDHS-MICS mostly contained questions on maternal and child health issues, but it also collected information on tobacco consumption. Data were managed with relevant variables indicating response on tobacco consumption being identified, sorted, and extracted.

The data analysis adopted a logistic regression model where the dependent variable is a set of binary indicators because an individual either consumes or does not consume tobacco. The model therefore constructs a binary logistic model to estimate the probability of a binary response based on a set of predictor variables. The set of independent variables $x$ include age group, place of residence (urban or rural), gender, marital status (never married, living together, married, widowed/divorced/separated), county/region, ethnicity, the highest level of education (no education/preschool, primary, secondary or higher education), occupation (whether unemployed, agriculture, service, casual labourer) whether the person is the head of the household, wealth (based on asset index calculated by the DHS), health status, perception to smoking and whether the person is staying at his/her permanent home at the time of the interview. The dependent variable is the status of tobacco consumption (smoker or non-smoker) defined as:

$$y_i = \begin{cases} 1 & \text{if the individual } i \text{ is a smoker} \\ 0 & \text{if } i \text{ is non smoker} \end{cases}$$

Either $y_i^*$, the unobserved variable defined by $y_i^* = x_i \beta + \epsilon_i$ where $\epsilon_i$ is a random variable of zero mean and standard deviation $\sigma_\epsilon$, with $\frac{\epsilon_i}{\sigma_\epsilon}$ which follows a logistic distribution function law $\phi(x) = \frac{\exp(x)}{1 + \exp(x)}$

Multivariate logistic regression models were used to evaluate the relationship between gender-based tobacco consumption and residence (urban/rural), age, marital status, education, socioeconomic quintile, and ethnic group.

The model is written considering the variable $y_i^*$ as follows:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases}$$

The underlying model is written:

$$y_i^* = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \beta_4 x_{i4} + \beta_5 x_{i5} + \epsilon_i$$

where:

- $x_{i1}$: the age range of the individual $i$;
- $x_{i2}$: marital status;
- $x_{i3}$: level of education;
- $x_{i4}$: economic welfare quintile;
- $x_{i5}$: ethnic.

$\beta = (\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5)^T$ is the model coefficient and $\epsilon_i$ is the error term.

Since, this model focuses on prevalence and socio-economic determinants, it does not include price as part of the independent variables for two reasons. First, the CDHS-MICS survey does not collect the prices of cigarettes. Secondly, the price of cigarettes does not vary significantly across the country in a given cross section because of the uniform taxes employed in the cigarettes. Further, the survey is collected within one period so variation as a result to variation in time is not expected.

Univariate and bivariate analysis was conducted. Analysis was done using the Excel spreadsheet and STATA version 15 software; the data were
submitted to: descriptive analysis for the calculation of different prevalence and the explanatory analysis which was conducted by a multivariate logistic regression of the status of tobacco consumption (smoker or non-smoker) as a function of the variables age group, marital status, level of education, quintile of economic well-being and ethnicity. The groups were separated by sex and place of residence. The significance level chosen for our study is 0.05 for 95% confidence intervals of the prevalence ratios.

3. Results

3.1 Descriptive Statistics

Overall, a total number of 22,617 respondents were recorded. The distribution of respondents by settlement shows that there were slightly more respondents from urban settlements 11,398 (50.4%) than from rural settlement 11,219 (49.6%). In term of sex the majority of respondents were females 15,426 (68.2%) and males 7,191 (31.8%). Mean age for all respondents was 29.8 years. Teenagers of 15-19 years old represent 5,202 (23.0%) of respondents and the majority of respondents 13,133 (58.1%) were people of 20-39 years old, and 1,875 (8.3%) were those of 40-44 years old while 2,407 (10.6%) were 45 years old and above. Most respondents were married (36.1%), followed by people living together (23.4%), never married (19.3%) and widowed (16.2%). The separated and divorced represent 3.2% and 1.9% respectively. The majority of respondents 8,854 (39.1%) had secondary level education, while 6,105 (27.0%) had primary level education, 4,282 (18.9%) had high (tertiary) level education, and 3,376 (14.9%) had no preschool formal education. The distribution of respondents by wealth index shows that most respondents were the richest with 5,183 (22.9%) and richer with 5,008 (22.1%) of respondents, while 4,432 (19.6%) were poorer, 4,228 (18.7%) were middle income and 3,766 (16.7%) were the poorest (Table 1).

3.2 Socioeconomic Determinants of Tobacco Consumption Prevalence in Cameroon

Overall, the prevalence of smoking tobacco was 5.3%, with higher prevalence in rural settlement (3.1%) and among males (15.3%) than in urban settlement (2.1%) and among females (0.5%); while the prevalence of smokeless tobacco was 1.3%, with 0.9% in rural settlement and 2.7% for males, and 0.3% in urban settlement and 0.6% for females (Fig. 1). Descriptive statistics on tobacco consumption patterns across urban and rural settings showed that in urban settlement the prevalence of tobacco consumption among women is 0.56% for smoked tobacco, 0.30% for smokeless tobacco and 0.01% for the combined consumption of both forms of tobacco. In rural settlement, the prevalence of tobacco consumption among women is 0.38% for smoked tobacco, 0.98% for smokeless tobacco and 0.05% for the combined consumption of both forms of tobacco. The prevalence of tobacco consumption by place of residence (rural versus urban) shows that in urban settlement, women consume smoked tobacco much more than smokeless tobacco, while in rural settlement smokeless tobacco is the most commonly consumed form of tobacco by women. Overall, on average, among women, tobacco consumption is higher in rural settlement than in urban settlement.

For men, in urban settlement, the prevalence of tobacco consumption is 12.23% for smoked tobacco, 1.52% for smokeless tobacco and 0.83% for the combined consumption of both forms of tobacco. In rural settlement, the prevalence of tobacco consumption is 19.15% for smoked tobacco, 3.94% for smokeless tobacco and 1.92% for the combined consumption of both forms of tobacco. The prevalence of tobacco consumption by place of residence indicates that in urban settlement, men consume smoked tobacco much more than smokeless tobacco, and in rural settlement smoked tobacco remains the most commonly consumed form of tobacco among men. On average, among men, the consumption of
Table 1  Socioeconomics and demographic distribution of respondents on tobacco consumption in Cameroon, 2011.

| Category                   | Number of respondents $(N = 22,617)$ | Percentage |
|----------------------------|---------------------------------------|------------|
| Settlement                 |                                       |            |
| Urban                      | 11,398                                | 50.4       |
| Rural                      | 11,219                                | 49.6       |
| Sex                        |                                       |            |
| Male                       | 7,191                                 | 31.8       |
| Female                     | 15,426                                | 68.2       |
| Age (years)                |                                       |            |
| 15-19                      | 5,202                                 | 23.0       |
| 20-24                      | 4,309                                 | 19.1       |
| 25-29                      | 3,678                                 | 16.3       |
| 30-34                      | 2,744                                 | 12.1       |
| 35-39                      | 2,402                                 | 10.6       |
| 40-44                      | 1,875                                 | 8.3        |
| 45 and above               | 2,407                                 | 10.6       |
| Marital status             |                                       |            |
| Never married              | 4,362                                 | 19.3       |
| Married                    | 8,154                                 | 36.1       |
| Living together            | 5,286                                 | 23.4       |
| Widowed                    | 3,661                                 | 16.2       |
| Divorced                   | 434                                   | 1.9        |
| Separated                  | 720                                   | 3.2        |
| Education                  |                                       |            |
| No preschool               | 3,376                                 | 14.9       |
| Primary                    | 6,105                                 | 27.0       |
| Secondary                  | 8,854                                 | 39.1       |
| High                       | 4,282                                 | 18.9       |
| Wealth quintiles           |                                       |            |
| Poorest                    | 3,766                                 | 16.7       |
| Poorer                     | 4,432                                 | 19.6       |
| Middle                     | 4,228                                 | 18.7       |
| Richer                     | 5,008                                 | 22.1       |
| Richest                    | 5,183                                 | 22.9       |

Fig. 1  National prevalence (%) of tobacco consumption patterns in Cameroon, 2011.

smoked tobacco is much more than smokeless tobacco in both urban and rural settlements.

With regards to age distribution, in urban settlement, among women the highest prevalence of tobacco consumption is 0.82% in the 35-39 age group and smokeless tobacco consumption is 1.27% in the 40-44 age group, while in rural settlement, the prevalence of smoked tobacco is 1.35% in the 40-44 age group and the prevalence of smokeless tobacco consumption is 2.71% in the 45-49 age group. Overall among women,
the highest prevalence of consumption of both forms of tobacco by age distribution is in the 40-44 years old, regardless of the settlement. The tobacco consumption among men in urban settlement shows that the highest prevalence of tobacco consumption is found in the 50-54 age group with 26.32% for smoked tobacco and 4.68% for smokeless tobacco; with 2.92% for the combined consumption of both forms of tobacco in the same age group. In rural settlement, for smoked tobacco, the highest prevalence is 31.68% in the 40-44 age group and 10.88% in the 55-59 age group for the smokeless tobacco. The prevalence of combined consumption of both forms of tobacco is 5.28% in the 45-49 age group. Overall, the prevalence of tobacco consumption by age group indicates that in urban settlement, more than 20% of men aged 35-54 years consume much more smoked tobacco and more than 4% of men aged 50-59 years old consume much more smokeless tobacco, while in rural settlement more than 20% of men aged 25-59 years consume much more smoked tobacco and more than 3% of men aged 40-59 years consume much more smokeless tobacco.

Tobacco consumption among women by marital status shows that in urban settlement, widows have the highest prevalence of both smoked tobacco and smokeless tobacco with 2.40% and 2.81% respectively, while in rural settlement the highest prevalence of smoked tobacco is recorded among divorced women 5.56% and smokeless tobacco among widows 1.32%. As for the combined consumption of both forms of tobacco, married women account for 0.03% in urban settlement and for 0.09% for cohabiting women in rural settlement. Men’s tobacco consumption in urban settlement indicates that separated men have the highest prevalence for smoked tobacco, smokeless tobacco and combined consumption of both forms respectively 36%, 8%, 4%. In rural settlement, the highest prevalence of smoked tobacco is found among divorced persons 46.15%, while it is 13.21% among divorced persons for smokeless tobacco. The combined consumption of both forms of tobacco is found among divorced persons with 8.55% in rural settlement.

According to the level of education of women, the descriptive statistics show that in urban settlement, the prevalence of smoked tobacco increases as the level of education increases; it is 0.62% for uneducated women and increases to 1.67% for women in higher education while the prevalence of smokeless tobacco decreases as the level of education increases; it is 0.63% for uneducated women and decreases to 0% for women in higher education. In rural settlement, the prevalence of tobacco consumption decreases as the level of education increases with respectively 0.55% for smoked tobacco and 1.07% for smokeless tobacco for uneducated women and 0.00% for any form of tobacco consumption among women with higher education level. The prevalence of smoked tobacco is 0.37% and 0.21% among women with primary and secondary education level respectively. While the prevalence of smokeless tobacco is respectively 1.06% and 0.59% among women with primary and secondary level of education. The dual consumption of tobacco decreases as the level of education increases with 0.16% of smoked tobacco and 0.09% of smokeless tobacco for uneducated women in urban and rural settlement respectively and 0.00% for women with high education level in both urban and rural settlements. Concerning tobacco consumption among men descriptive statistics show that the highest prevalence of smoked tobacco is found among men with secondary education level with 15.31% and 23.49% in urban and rural settlements respectively. The highest prevalence of smokeless tobacco is found among primary educated men with 4.32% in urban settlement and 5.35% in rural settlement. The highest prevalence of dual tobacco consumption 2.74% is found among men with secondary level of education in rural settlement and 2.16% among primary educated men in urban settlement. Overall, the highest smoked tobacco consumption prevalence was found among secondary educated men with 20.7%, followed
by men with high education level (13.5%) and primary educated men with 12.8% and the low prevalence was found among no preschool men with 10.5% (Fig. 2). However, the highest prevalence of smokeless tobacco consumption was found among primary educated men (5.1%), followed by secondary educated men (4.2%) and high educated men (1.5%) and no preschool men (1%). In general, as presented in Fig. 3, for women, the highest smoked prevalence was found among high-educated women (1.5%), followed by no preschool women (0.6%), women with primary education level (0.5%) and secondary educated women (0.3%). While for smokeless tobacco consumption, the highest prevalence was found among no preschool women (1%), followed by primary educated women (0.9%) and secondary educated women (0.3%).

Tobacco consumption by wealth quintiles indicates that among women, in urban settlement, the highest prevalence is among the poorer (second quintile) for both smoked and smokeless tobacco with 1.02% and 1.46% respectively; and for the dual consumption of both forms of tobacco, the highest prevalence is found in the middle class with 0.06%. The prevalence of smoked tobacco is 0.91% for the richest women, 0.31% for the richer women and 0.25% for the middle class women; while the prevalence of smokeless tobacco is 0.45% for the middle class, 0.35% for the richer women and 0.09% for the richest women in urban settlement. In rural settlement, the prevalence of smoked tobacco is 0.78% among the richest women and 1.35% for smokeless tobacco among the poorest women. The prevalence of dual consumption of tobacco is 0.34% among the richest women. The prevalence of smoked tobacco is 0.39% for the middle

Fig. 2 Percent of male tobacco consumption prevalence by education level in Cameroon, 2011.

Fig. 3 Percent of female smokeless tobacco prevalence by education level in Cameroon, 2011.
class women and 0.29% for the poorer women (second quintile); while the prevalence of smokeless tobacco consumption 0.88% for the poorer women, 0.61% for the middle class women, 0.52% for the richer women and 0.69% in rural settlement.

Tobacco consumption among men in urban settlement shows that the highest prevalence is found among the poorer (second quintile) for both smoked and smokeless tobacco and the dual consumption of tobacco with 18.48%, 7.61% and 2.17% respectively. The prevalence of smoked tobacco is 17% for the poorest men, 11.35% for the richer men and 10.58% for the richest men; while the prevalence of smokeless tobacco is 2.88% for the poorest men, 1.17% for the richer men and 0.88% for the richest men in rural settlement. The prevalence of dual tobacco consumption is 1.37% for the poorest men, 0.78% for the richer men and 0.56% for the richest men. In rural settlement, the highest prevalence is found among poorer men (second quintile) with 21.45% for smoked tobacco, 2.82% of smokeless tobacco for the poorest men (first quintile); while the prevalence of dual consumption of tobacco is 1.17% for poorer men. The prevalence of smoked tobacco is 20% for the middle class, 17.42% for the poorest men, 15.68% for the richer men and 8.82% for the richest men; while the prevalence of smokeless tobacco is 2.80% for the poorer men, 7.69% for the middle class men, and 0.35% for the richer men in rural settlement.

According to ethnicity of women respondents, in urban settlement, the highest prevalence of smoked tobacco is found among coastal dwellers with 1.50% and the smokeless tobacco among foreigners with 1.35%. The dual consumption of both forms of tobacco is found among Arab-Choa with 0.15%. In rural settlement, the prevalence of smoked tobacco is 2.08% among Bantoide women of South West and 2.16% for smokeless tobacco among Beti/Bassa/MBamoi ethnic group. The high prevalence of dual consumption of both forms of tobacco is 0.50% among the Kako/Meka/Pygmy ethnic group.

Among men respondents in urban settlement, the highest prevalence of smoked tobacco is found among coastal people with 18.65% and smokeless tobacco among Kako/Meka/Pygmy ethnic group with 4%. For the combined consumption of both forms of tobacco, the highest prevalence is found among Kako/Meka/Pygmy ethnic group with 2.67%. In rural settlement, the highest prevalence is found among the Kako/Meka/Pygmy ethnic group, whether for both forms of combined consumption with 38.12% for smoked tobacco, 10.31% for smokeless tobacco and 6.73% for combined consumption of both forms of tobacco respectively. Overall, in Cameroon, tobacco consumption prevalence is determined by socioeconomic factors ranging from age, marital status, education, income and ethnic groups as presented in Table 2.

3.3 Multivariate Analysis of Tobacco Consumption in Cameroon

Concerning the consumption of smoked tobacco among men, the likelihood ratio statistic test was 335.42 for the urban settlement and 536.96 for the rural settlement with a zero critical probability ($p < 0.00$), reflecting a good fit of the model. Whit regards to the consumption of smoked tobacco among women, the likelihood ratio statistic test was 23.11 for urban settlement and 29.06 for rural settlement with a zero critical probability ($p < 0.01$), reflecting a good fit of the model. Moreover, for the consumption of smokeless tobacco among men, the likelihood ratio statistic test was 12.18 for urban and 33.34 for rural settlements with a critical probability ($p < 0.01$), reflecting a good fit of the model. For women consumption of smokeless tobacco, the likelihood ratio statistic test was 12.39 for the urban settlement and 39.31 for the rural settlement with a critical probability ($p < 0.01$), reflecting a good fit of the model. By type of settlement (urban versus rural), Tables 3 and 4 present prevalence ratios, $p$-values and the 95% confidence interval for the association of consuming smoked and smokeless tobacco with
socio-economic and demographic variables among men and women in Cameroon.

In urban settlement, tobacco consumption by age suggests that compared to the 15-19 age group, 20-34 years old men were on average five times more likely to consume smoked tobacco, while 35-54 years old men were on average thirteen times more likely, and 55-59 years old men were seven times more likely to consume smoked tobacco ($p < 0.00$). However, no specific age group did not significantly influence the consumption of smoked tobacco among women in both urban and rural settlements. Even though, in urban settlement as compared to the 15-19 age group, 20-49 years old women were on average 0.7 times more likely to consume smoked tobacco; while in rural settlement, 20-34 years old women were 0.9 times more likely to consume smoked tobacco and 35-49 years old women were 1.5 times more likely to consumed smoked tobacco. In rural settlement, compared to the 15-19 age group, 20-39 years old men were on average seven times more likely to consume smoked tobacco, while men aged 40-54 years old men were on average eleven times more likely, and the group of 55-59 years old men was eight times more likely to consume smoked tobacco ($p < 0.00$). For smokeless tobacco, the age did influence its consumption among women and men in both urban and rural settlements, but the differences were not significant between various age groups across settlements.

Tobacco consumption by marital status, in urban settlement, by referencing to never married (single) people, only men who were separated from their partners were about twice as likely to consume smoked tobacco ($p < 0.00$); while only women who were widowed were about seven times more likely to consume smoked tobacco compared to single women ($p < 0.03$). In rural settlement, divorced men were about three times more likely to consume smoked tobacco ($p < 0.01$). Meanwhile, the marital status did influence the consumption of smokeless tobacco among men and women in urban as well as rural settlement, but the differences were not significant between various categories of marital status.

The consumption of tobacco by education suggested that as compared to no preschool, the education level attainment influenced the likelihood of consuming smoked and smokeless tobacco among men and women in both urban and rural settlements, but the differences were not significant between levels of education attainment.

Tobacco consumption by economic quintiles indicates that, in urban settlement, for men the likelihood of consuming smoked tobacco was 0.3 times less for the richer and 0.24 times less for the richest as compared to the poorest ($p < 0.00$). In rural settlement, compared to the poorest, the poorer men were 0.54 times less likely, the middle income men were 0.37 times less likely, the richer men were 0.33 times less likely and the richest were 0.16 times less likely to consume smoked tobacco ($p < 0.00$). For women, the economic status did influence the consumption of smoked and smokeless tobacco, but the differences were not significant between quintiles of well-being in urban as well as in rural settlements. Moreover, the likelihood of tobacco consumption both smoked and smokeless tobacco was influenced by ethnicity, but the differences were not significant between ethnic groups across men and women in urban and rural settlements.

4. Discussion

Results show socioeconomic differences and patterns of tobacco consumption in Cameroon. In urban settlement, smoking tobacco among men showed a bigger magnitude than smokeless tobacco. However, both were consistent as the prevalence was considerably more among adult men than the younger ones in urban and rural settlements. In rural settlement, the same can be said among men though smoking tobacco consumption was still higher than smokeless tobacco. The consumption of smoking and smokeless
| Characteristics | Men | Rural | Women | Rural |
|----------------|-----|-------|-------|-------|
| N             | N   | N     | N     | N     |
| Urban         |     |       |       |       |
| Smoking       | 3,626 | 12.23% | 1.52% | 0.83% | 3,565 | 19.15% | 3.94% | 1.92% | 7,772 | 0.56% | 0.30% | 0.01% | 7,654 | 0.38% | 0.93% | 0.05% |
| prevalence    |     | Smokless |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Dual use      | 0.35% | 0.35% | 0.23% | 0.64% | 0.35% | 0.06% | 0.06% | 0.10% | 0.00% | 0.75% | 0.95% | 0.03% | 0.02% | 0.02% | 0.03% | 0.04% |
| Rural         |     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Smoking       | 2.76% | 2.65% | 1.50% | 1.70% | 2.65% | 0.00% | 0.00% | 0.00% | 0.00% | 0.75% | 0.92% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| prevalence    |     | Smokless |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Dual use      | 1.70% | 1.85% | 1.85% | 1.85% | 1.85% | 0.00% | 0.00% | 0.00% | 0.00% | 0.75% | 0.92% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Women         |     |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Smoking       | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.75% | 0.92% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| prevalence    |     | Smokless |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Dual use      | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.75% | 0.92% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

| Age group | Men | Rural | Women | Rural |
|-----------|-----|-------|-------|-------|
| 15-19     |     |       |       |       |
| Age group |     |       |       |       |
| 15-19     | 852 | 2.23% | 0.35% | 0.23% | 760 | 2.76% | 0.26% | 0.00% | 1,841 | 0.23% | 0.00% | 0.00% | 1,749 | 0.00% | 0.00% | 0.00% |
| 20-24     | 709 | 7.19% | 1.69% | 1.13% | 482 | 14.52% | 2.28% | 1.24% | 1,744 | 0.81% | 0.06% | 0.00% | 1,374 | 0.16% | 0.51% | 0.00% |
| 25-29     | 519 | 11.18% | 1.93% | 1.16% | 498 | 20.88% | 2.21% | 1.20% | 1,369 | 0.46% | 0.22% | 0.00% | 1,292 | 0.49% | 0.54% | 0.08% |
| 30-34     | 436 | 13.53% | 1.61% | 0.92% | 400 | 24.00% | 2.25% | 1.50% | 943 | 0.44% | 0.21% | 0.00% | 965 | 0.43% | 0.31% | 0.00% |
| 35-39     | 328 | 24.39% | 1.52% | 0.30% | 386 | 24.35% | 4.40% | 2.07% | 801 | 0.82% | 0.75% | 0.00% | 887 | 0.21% | 1.92% | 0.00% |
| 40-44     | 279 | 22.22% | 1.08% | 0.72% | 322 | 31.68% | 6.21% | 3.11% | 551 | 0.75% | 1.27% | 0.18% | 723 | 1.35% | 2.63% | 0.41% |
| 45-49     | 197 | 24.37% | 0.51% | 0.51% | 284 | 29.58% | 10.56% | 5.28% | 523 | 0.78% | 0.76% | 0.00% | 664 | 0.63% | 2.71% | 0.00% |
| 50-54     | 171 | 26.32% | 4.68% | 2.92% | 240 | 27.92% | 7.92% | 4.17% | - | - | - | - | - | - | - | - |
| 55-59     | 135 | 15.56% | 4.44% | 0.74% | 193 | 23.32% | 10.88% | 3.63% | - | - | - | - | - | - | - | - |

| Marital status | Men | Rural | Women | Rural |
|----------------|-----|-------|-------|-------|
| Never married  |     |       |       |       |
| Married        |     |       |       |       |
| Living together|     |       |       |       |
| Widowed        |     |       |       |       |
| Divorced       |     |       |       |       |
| Separated      |     |       |       |       |
| Highest level of education | Men | Rural | Women | Rural |
| No preschool   |     |       |       |       |
| Primary        |     |       |       |       |
| Secondary      |     |       |       |       |
| High           |     |       |       |       |
| Wealth quintiles | Men | Rural | Women | Rural |
| Poorest        |     |       |       |       |
| Poorer         |     |       |       |       |
| Middle         |     |       |       |       |
| Richer         |     |       |       |       |
| Richest        |     |       |       |       |
Table 2 to be continued

| Ethnic groups                  | Male | Female | Male | Female |
|--------------------------------|------|--------|------|--------|
| Adamawa-oumboungui             | 248  | 7.26%  | 500  | 14.20% |
| Arabe/peulh/haoussa/kanuri     | 287  | 6.97%  | 348  | 4.31%  |
| Bamilek/bamoun                 | 1,200| 12.75% | 346  | 16.47% |
| Bantoïde sud-ouest             | 60   | 8.33%  | 47   | 27.66% |
| Beti/bassa/bamoun              | 808  | 13.12% | 767  | 24.38% |
| Biu-mandara                    | 254  | 10.24% | 540  | 13.33% |
| Côtier/ngoe/oroko              | 193  | 18.65% | 153  | 19.61% |
| Grassfields                    | 425  | 13.88% | 531  | 23.73% |
| Koko/meke/pygme                | 75   | 13.33% | 95   | 25.26% |
| Foreigners/others              | 65   | 13.85% | 3.08%| 1.54%  |

Table 3  Adjusted prevalence ratios of male tobacco consumption across urban and rural areas in Cameroon.

| Characteristics          | Urban Smoking | Smokeless | Rural Smoking | Smokeless | p-value |
|--------------------------|---------------|-----------|---------------|-----------|---------|
| Age group                | [PR [95% CI]  | p-value   | [PR [95% CI]  | p-value   |         |
| 15-19                    | 1.00          | 1.00      | 1.00          | 1.00      |         |
| 20-24                    | 3.43 [1.98; 5.91] | 0.00      | 1.03 [0.57; 1.84] | 0.93      | 5.22 [3.13; 8.71] | 0.00      | 1.15 [0.59; 2.24] | 0.68 |
| 25-29                    | 5.38 [3.04; 9.50] | 0.00      | 0.55 [0.23; 1.30] | 0.17  | 7.85 [4.66; 13.21] | 0.00  | 1.56 [0.76; 3.18] | 0.22 |
| 30-34                    | 6.40 [3.49; 11.74] | 0.00  | 0.78 [0.31; 1.98] | 0.60  | 8.63 [4.96; 15.01] | 0.00  | 1.88 [0.83; 4.30] | 0.13 |
| 35-39                    | 13.08 [7.07; 24.19] | 0.00  | 0.45 [0.14; 1.49] | 0.19  | 8.94 [5.09; 15.72] | 0.00  | 0.79 [0.27; 2.31] | 0.67 |
| 40-44                    | 11.42 [6.04; 21.62] | 0.00  | 0.87 [0.29; 2.60] | 0.81  | 11.97 [6.77; 21.16] | 0.00  | 1.40 [0.53; 3.72] | 0.50 |
| 45-49                    | 14.39 [7.41; 27.94] | 0.00  | 0.13 [0.02; 1.14] | 0.07  | 11.66 [6.50; 20.92] | 0.00  | 1.45 [0.53; 4.01] | 0.47 |
| 50-54                    | 14.89 [7.52; 29.51] | 0.00  | 0.32 [0.06; 1.66] | 0.17  | 10.44 [5.71; 19.09] | 0.00  | 0.68 [0.17; 2.66] | 0.58 |
| 55-59                    | 7.34 [3.45; 15.62] | 0.00  | 0.41 [0.08; 2.16] | 0.29  | 8.07 [4.29; 15.19] | 0.00  | 1.81 [0.60; 5.50] | 0.29 |
| Marital status            |               |          |               |          |         |
| Never married             | 1.00          | 1.00      | 1.00          | 1.00      |         |
| Married                   | 0.95 [0.66; 1.39] | 0.81  | 1.06 [0.46; 2.42] | 0.90  | 1.02 [0.74; 1.41] | 0.92  | 0.54 [0.28; 1.06] | 0.08 |
| Living together           | 1.35 [0.92; 2.00] | 0.13  | 1.00 [0.44; 2.25] | 0.99  | 1.42 [1.00; 2.02] | 0.05  | 0.92 [0.44; 1.94] | 0.83 |
| Widowed                   | 2.29 [0.90; 5.80] | 0.08  | 1.00          | -     | -      | 1.91 [0.86; 4.26] | 0.11  | 1.00       | -     |
| Divorced                  | 1.80 [0.71; 4.56] | 0.21  | 1.98          | 0.983 [0.23; 17.34] | 0.54  | 3.09 [1.57; 6.08] | 0.00  | 1.00       | -     |
| Separated                 | 2.19 [1.29; 3.69] | 0.00  | 1.00          | -     | -      | 2.82 [1.74; 4.57] | 0.00  | 0.76 [0.24; 2.40] | 0.64 |
| Highest level of education|               |          |               |          |         |
| No preschool              | 1.00          | 1.00      | 1.00          | 1.00      |         |
| Primary                   | 1.23 [0.65; 2.33] | 0.53  | 0.59 [0.20; 1.77] | 0.35  | 1.21 [0.84; 1.73] | 0.31  | 0.68 [0.35; 1.34] | 0.27 |
| Secondary                 | 1.20 [0.63; 2.29] | 0.58  | 0.46 [0.15; 1.38] | 0.17  | 0.87 [0.59; 1.30] | 0.50  | 0.75 [0.36; 1.57] | 0.45 |
| High                      | 0.82 [0.40; 1.68] | 0.59  | 0.31 [0.08; 1.14] | 0.08  | 0.42 [0.18; 0.99] | 0.05  | 0.37 [0.04; 3.06] | 0.36 |

Table 3 to be continued
| Wealth quintiles | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
|------------------|------|------|------|------|------|------|
| Poorest          | -    | -    | -    | -    | -    | -    |
| Poorer           | 0.62 | [0.32; 1.11] | 0.16 | 0.89 | [0.24; 3.37] | 0.87 | 0.37 | [0.26; 0.52] | 0.00 | 1.57 | [0.77; 3.19] | 0.21 |
| Middle           | 0.30 | [0.15; 0.60] | 0.00 | 0.55 | [0.14; 2.13] | 0.39 | 0.33 | [0.21; 0.52] | 0.00 | 1.04 | [0.37; 2.90] | 0.94 |
| Richer           | 0.24 | [0.12; 0.48] | 0.00 | 0.66 | [0.17; 2.60] | 0.55 | 0.16 | [0.08; 0.31] | 0.00 | 0.85 | [0.21; 3.38] | 0.82 |
| Richest          | -    | -    | -    | -    | -    | -    |

| Ethnic groups    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
|------------------|------|------|------|------|------|------|
| Adamoua-oubangui | 0.88 | [0.40; 1.92] | 0.75 | 0.97 | [0.25; 3.81] | 0.97 | 1.83 | [0.92; 3.66] | 0.09 | 1.19 | [0.44; 3.22] | 0.73 |
| Bamiléké/bamoun | 0.73 | [0.34; 1.56] | 0.44 | 1.24 | [0.33; 4.65] | 0.75 | 1.72 | [0.89; 3.33] | 0.11 | 1.09 | [0.40; 2.94] | 0.87 |
| Bantoïde sud-ouest | 0.51 | [0.15; 1.17] | 0.27 | 2.10 | [0.18; 24.07] | 0.55 | 3.45 | [1.05; 11.34] | 0.04 | 1.09 | [0.07; 16.30] | 0.95 |
| Beti/bassa/mbamoi | 1.03 | [0.46; 2.31] | 0.94 | 2.39 | [0.45; 12.59] | 0.30 | 3.09 | [1.19; 8.04] | 0.02 | 0.83 | [0.12; 5.73] | 0.85 |
| Biu-Mandara      | 0.84 | [0.41; 1.73] | 0.63 | 2.57 | [0.64; 10.36] | 0.19 | 2.92 | [0.95; 9.01] | 0.06 | 2.64 | [0.37; 18.94] | 0.34 |
| Côtier/ngoe/oroko | 1.58 | [0.70; 3.60] | 0.27 | 0.69 | [0.06; 7.87] | 0.77 | 1.89 | [0.68; 5.26] | 0.22 | 0.61 | [0.07; 5.65] | 0.66 |
| Grassfields      | 0.99 | [0.47; 2.11] | 0.99 | 3.35 | [0.80; 14.15] | 0.10 | 3.05 | [1.22; 7.62] | 0.02 | 1.05 | [0.20; 5.51] | 0.96 |
| Kako/meka/pygmé | 1.11 | [0.38; 3.23] | 0.84 | 4.03 | [0.52; 31.17] | 0.18 | 3.25 | [1.36; 7.75] | 0.01 | 1.27 | [0.24; 6.69] | 0.78 |
| Foreigners/others | 0.99 | [0.38; 2.56] | 0.98 | 2.52 | [0.40; 16.01] | 0.33 | 3.45 | [1.46; 8.20] | 0.18 | 0.15 | [0.25; 5.68] | 0.83 |

| Observations     | 3,626 | 3,626 | 3,565 | 3,565 | 3,565 | 3,565 |

**Table 4** Adjusted prevalence ratios of female tobacco consumption across urban and rural areas in Cameroon.

| Characteristics  | Urban | | | Rural | | |
|------------------|------|------|------|------|------|------|
|                  | Smoking | Smokeless | Smoking | Smokeless | Smoking | Smokeless |
|                  | PR | [95% CI] | p-value | PR | [95% CI] | p-value | PR | [95% CI] | p-value | PR | [95% CI] | p-value |
| Age group        |      |      |      |      |      |      |      |      |      |      |      |      |
| 15-19            | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 20-24            | 1.02 | [0.31; 3.41] | 0.97 | 1.90 | [0.75; 4.80] | 0.18 | 0.37 | [0.03; 4.18] | 0.42 | 0.96 | [0.24; 3.90] | 0.96 |
| 25-29            | 0.72 | [0.18; 2.83] | 0.64 | 1.09 | [0.35; 3.42] | 0.89 | 0.91 | [0.14; 6.04] | 0.93 | 2.99 | [0.90; 10.00] | 0.08 |
| 30-34            | 0.36 | [0.06; 2.19] | 0.27 | 1.09 | [0.31; 3.82] | 0.90 | 1.42 | [0.21; 9.61] | 0.72 | 3.41 | [0.98; 11.92] | 0.06 |
| 35-39            | 0.90 | [0.19; 4.28] | 0.89 | 1.98 | [0.61; 6.39] | 0.26 | 1.30 | [0.20; 8.62] | 0.79 | 1.55 | [0.35; 6.87] | 0.56 |
| 40-44            | 0.60 | [0.09; 3.97] | 0.60 | 0.76 | [0.14; 4.14] | 0.75 | 2.38 | [0.40; 14.36] | 0.34 | 1.48 | [0.30; 7.28] | 0.63 |
| 45-49            | 0.72 | [0.12; 4.26] | 0.72 | 2.49 | [0.67; 9.20] | 0.17 | 0.94 | [0.11; 8.09] | 0.96 | 2.67 | [0.62; 11.57] | 0.19 |
| Marital status   |      |      |      |      |      |      |      |      |      |      |      |      |
| Never married    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Married          | 1.71 | [0.51; 5.70] | 0.38 | 0.98 | [0.39; 2.45] | 0.96 | 0.88 | [0.12; 6.60] | 0.90 | 0.99 | [0.33; 3.01] | 0.99 |
| Living together  | 2.86 | [0.94; 8.70] | 0.06 | 1.59 | [0.67; 3.80] | 0.30 | 2.60 | [0.32; 21.33] | 0.37 | 2.23 | [0.63; 7.97] | 0.22 |
| Widowed          | 7.35 | [1.25; 43.27] | 0.03 | 0.96 | [0.17; 5.30] | 0.96 | 1.00 | - | - | 0.62 | [0.07; 5.86] | 0.68 |
| Divorced         | 1.00 | - | - | 1.00 | - | - | 23.10 | [2.24; 238.53] | 0.01 | 1.95 | [0.20; 19.20] | 0.57 |
| Separated        | 2.13 | [0.39; 11.63] | 0.38 | 0.75 | [0.15; 3.65] | 0.72 | 6.71 | [0.66; 68.41] | 0.11 | 1.00 | - | - |

Table 4 to be continued
| Highest level of education | No preschool | 1.00 | 1.00 | 1.00 | 1.00 |
|---------------------------|-------------|------|------|------|------|
| Primary                   | 1.50        | 0.25 ; 9.13 | 0.66 | 1.03 | 0.29 ; 3.68 | 0.97 | 0.42 | 0.10 ; 1.77 | 0.24 | 1.26 | 0.51 ; 3.15 | 0.62 |
| Secondary                 | 0.67        | 0.10 ; 4.75 | 0.69 | 0.56 | 0.14 ; 2.23 | 0.41 | 0.21 | 0.03 ; 1.57 | 0.13 | 0.72 | 0.20 ; 2.64 | 0.62 |
| High                      | 1.82        | 0.22 ; 15.17 | 0.58 | 0.11 | 0.01 ; 1.17 | 0.07 | 1.00 | -           | -   | 1.00 | -          | -   |

| Wealth quintiles          | Poorest     | 1.00 | 1.00 | 1.00 | 1.00 |
|---------------------------|-------------|------|------|------|------|
| Poorer                    | 0.67 | 0.07 ; 6.67 | 0.73 | 0.86 | 0.09 ; 7.93 | 0.90 | 1.10 | 0.24 ; 5.02 | 0.91 | 1.38 | 0.51 ; 3.71 | 0.52 |
| Middle                    | 0.47 | 0.04 ; 5.10 | 0.54 | 1.57 | 0.18 ; 14.04 | 0.69 | 0.79 | 0.06 ; 10.37 | 0.86 | 1.80 | 0.48 ; 6.72 | 0.38 |
| Richest                   | 1.26 | 0.12 ; 13.53 | 0.85 | 2.09 | 0.23 ; 19.34 | 0.52 | 1.70 | 0.09 ; 31.06 | 0.72 | 1.25 | 0.14 ; 11.53 | 0.84 |

| Ethnic groups             | Adamaoua-oubangui | 1.00 | 1.00 | 1.00 | 1.00 |
|---------------------------|-------------------|------|------|------|------|
| Arabe/peulh/haoussa/kanuri | 5.49 | 0.40 ; 75.15 | 0.20 | 0.84 | 0.14 ; 5.02 | 0.85 | 7.20 | 0.53 ; 98.10 | 0.14 | 1.10 | 0.20 ; 6.04 | 0.91 |
| Bamileké/bamoun            | 1.26 | 0.07 ; 23.68 | 0.88 | 0.55 | 0.08 ; 3.82 | 0.54 | 1.11 | 0.11 ; 10.97 | 0.93 | 0.93 | 0.21 ; 4.17 | 0.92 |
| Bantoïde sud-ouest         | 1.00 | -              | -    | 1.79 | 0.12 ; 26.58 | 0.67 | 17.51 | 0.01 ; 36.871 | 0.46 | 1.00 | -          | -   |
| Beti/bassa/mbamoi          | 2.43 | 0.11 ; 54.86 | 0.58 | 1.23 | 0.16 ; 9.55 | 0.84 | 0.56 | 0.00 ; 1.277 | 0.88 | 1.74 | 0.08 ; 39.73 | 0.73 |
| Biu-mandara                | 2.71 | 0.18 ; 41.77 | 0.47 | 1.24 | 0.19 ; 7.99 | 0.82 | 1.30 | 0.00 ; 9.747.3 | 0.95 | 0.07 | 0.00 ; 3.34 | 0.18 |
| Côtier/ngoe/oroko          | 5.88 | 0.29 ; 1.73 | 0.25 | 1.31 | 0.15 ; 11.74 | 0.81 | 4.95 | 0.00 ; 10.423 | 0.68 | 0.99 | 0.02 ; 39.33 | 0.99 |
| Grassfields                | 2.82 | 0.17 ; 46.73 | 0.47 | 0.72 | 0.10 ; 4.99 | 0.74 | 6.57 | 0.00 ; 46.73 | 0.69 | 3.50 | 0.26 ; 47.29 | 0.35 |
| Kako/meka/pygmé            | 4.27 | 0.13 ; 141.10 | 0.42 | 1.00 | -          | - | 346.76 | 0.03;455,294 | 0.23 | 0.25 | 0.02 ; 2.63 | 0.25 |
| Foreigners/others          | 1.00 | -              | -    | 0.99 | 0.09 ; 11.26 | 0.99 | 1.00 | -          | -   | -    | -          | -   |

| Observations               | 7,772 | 7,772 | 7,654 | 7,654 |
tobacco among women showed similar magnitude in both urban and rural settlements. Meanwhile, in rural settlement, the consumption of smokeless tobacco among women was considerably more prevalent than smoking tobacco although in urban settlement the consumption of smokeless tobacco was less prevalent than smoking tobacco among women. Indeed, both smoking and smokeless tobacco as well as dual consumption increased with age among men and women in urban and rural settlements. Smoking tobacco consumption was significantly higher in urban and rural settlements for all age groups, whereas smokeless tobacco consumption was higher in rural settlement than urban settlement. The prevalence of smoking and smokeless tobacco relatively decreased as education rises among men in both urban and rural settlements, whereas among women, smokeless tobacco consumption declined with higher education. These findings were expected because of the addictive nature of tobacco consistent with other findings that conclude that soon after initiation, nicotine addiction makes withdrawal unpleasant and many find themselves regular smokers [5, 21-23], and this also highlighted the differences in tobacco consumption by gender and education for a country at the early stages of the tobacco epidemic [24, 25]. The higher prevalence of tobacco consumption among adult’s men and women was also consistent with previous studies which found low prevalence among young adults by suggesting that ban on advertising and increase in tobacco taxes have been effective tools and older generations have more spending power and have relatively higher prevalence rate because at their time of youth, advertising and branding was allowed making initiation easier [5, 10]. This study also found that consumption among women remained low across urban and rural settlements in Cameroon. The relatively low female’s smoking tobacco prevalence may reflect cultural differentiation by social class whereby smoking tobacco for women remains relatively non-acceptable while the consumption of smokeless tobacco tends to be acceptable for women particularly in rural settlement. These results were also consistent with other findings which concluded that this is a positive starting point for tobacco control proponents, even if this pattern should not be taken for granted nor ignored because the tobacco industry actively targets women with specific manufacturing strategies as part of their effort to expand their market particularly in low- and middle-income African countries [26, 27]. Broadly, the findings of this study had consistently shown that both men and women with low socioeconomic factors report higher smoking and smokeless tobacco prevalence in Cameroon. This negative socioeconomic-associated factor of smoking and smokeless tobacco consumption persists irrespective of the factors used, although it was stronger for education than income in both urban and rural settlements. These findings were consistent with other studies that suggested in many countries, high education groups were less likely to consume smoking and smokeless tobacco than those with low education [26, 28, 29]. These trends suggest that public health interventions focused solely on reducing cigarette smoking, at the expense of addressing structural determinants of negative health behaviours, have been effective with advantaged social groups but ineffective in reaching those with low education and low income [30, 31]. The findings of this study also showed that men and women display different patterns of tobacco consumption by socioeconomic factors. Wealth, did show a clear pattern and exerts a much weaker protective effect on the consumption of smoking and smokeless tobacco among men and women in Cameroon. Both men and women in the poor wealth quintiles had a higher prevalence of consuming smoking and smokeless tobacco than rich people in urban and rural settlements. These findings can be explained by the fact that new health ideas and practices are adopted first by socially advantaged individuals and groups, and are taken up relatively late in the diffusion process by the disadvantaged. This
Prevalence and Socioeconomic Determinants of Tobacco Consumption Patterns across Urban and Rural Settings in Cameroon

confirms how education embodies access to knowledge and resources, and therefore enables individuals who possess it to respond to interventions that focus on behavioural change.

5. Conclusion

In Cameroon, the consumption of smoking and smokeless tobacco among men and women was predominant among those with low level of education as a fundamental cause. Consumption patterns in the survey follow a logical pattern because educational levels and public awareness are impactful in reducing tobacco consumption on the more literate population. The relative negative association between wealth and smoking tobacco suggested that access to material resources did not precipitate a reduction in the consumption of tobacco. High smokeless tobacco consumption in rural settlement with lower wealth quintiles was also expected because smokeless tobacco maybe cheaper and poor people would like to consume it. In addition, the likelihood of smoking tobacco and being poor and uneducated was higher in rural settlement. Further, the findings suggest that tobacco consumers who are poor and uneducated live in rural settlement. Tobacco control efforts must focus on socioeconomic determinants to prevent surge consumption. One discernable reason for this was the cheap price of smoking and smokeless tobacco in Cameroon; to promote good governance in tobacco control, increased taxation on smoking tobacco would be likely to act both through prevention and through cessation tobacco pathways. With tobacco-use being an established risk factor for cardiovascular disease and cancer, reducing its prevalence has thus been advocated by public health specialists and policy makers as one of the “best buys” to reduce the burden of non-communicable diseases (NCDs) in sub-Saharan African countries. This paper recommends that the government, under the stewardship of the ministry of health, continues to strengthen multi-sectoral public policy that establishes and strengthens tobacco control and other NCD risk prevention factors. This will ensure the World Health Organization (WHO) 2013-2020 action plan for the prevention and control for NCDs which includes 30% reduction in tobacco consumption prevalence, with countries having 100% smoke free legislations, building capacity of citizens on dangers of tobacco consumption through evidence-based information and raising taxes among other measures.

6. Limitations

Although this study provided important insight into the prevalence and socioeconomic determinants of smoking and smokeless tobacco consumption in Cameroon, the main study limitations are concerned with the cross-sectional design that did not allow us to measure changes in the socioeconomic patterning of tobacco consumption over time, and this would be a reasonable next step to gain further understanding of the issue. It was not easy to find the causal links between socioeconomic determinants and tobacco consumption. In addition, the data on unit price of tobacco were not available and could not be included as a determinant of tobacco consumption even though price is one of the most important determinants of tobacco consumption worldwide. Moreover, the DHS excludes women over age 49 and men over age 59, which may bias our estimates of the true prevalence of tobacco consumption in Cameroon downwards, where life expectancy of women and men maybe above the maximum age limit included in the study.

Acknowledgments

The authors would like to thank the ICF through The Demographic and Health Surveys (DHS) Program for approving and granting us the use of Survey Datasets.

Authors’ Contribution

Zakariaou Njoumene conceptualized and conducted the analysis, writing first draft and editing of the paper.
Altiné Fadimatou contributed to the analysis, writing, reviewing and editing of the manuscript. Nadia Ampoulia Biwouele Bwemba contributed to reviewing and editing of the manuscript.

**Funding**

No specific funding was received.

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