Socio-Economic and Demographic Factors, and Tobacco Use in Togo.

Mawusse Komlagan Nezan OKEY[1] and Makiliwe BARCOLA[2*]

[1]*Associate Professor at Department of Economy of University of Lome, Research Team in Institutional Economics (ERECI), Togo*

[2]*Researcher at ERECI, Department of Economy of University of Lome, Research Team in Institutional Economics (ERECI), Togo*

[*]**Corresponding author:**
Makiliwe BARCOLA, Researcher at ERECI, Department of Economy of University of Lome, Research Team in Institutional Economics (ERECI), Togo

Abstract
Consequences of smoking are disastrous and supported by smokers and non-smokers. Tobacco control policies in Togo seem to have no significant effect. Thus, for more effectiveness in tobacco control policies, it would be appropriate to identify the determinants of the demand for tobacco products or the factors likely to influence it; to better position tobacco control policies in order to better allocate resources. In order to achieve this objective, we analyzed the socioeconomic and demographic determinants of tobacco use in Togo. This study uses the 2014 Togo Demographic and Health Survey (EDST3). A logistic regression is used to estimate the probability of an individual smoking, given a set of socio-economic, geographic and demographic characteristics. We found that tobacco use is influenced by genders, age, region and, educational, religion and work status. Thus, there is a socio-economic, demographic and geographic disparity in smoking and therefore tobacco control policies must be based on this dynamic for greater efficiency.

Keywords: Smoking, Socioeconomic and Demographic Factors, Prevalence.

Introduction

The consequences of smoking are disastrous for the health of smokers and non-smokers alike and has a very high social cost. An estimation by Goodchild et al indicates that smoking costs an average of 2,410 million CFA francs per year in Togo. Indeed, this social cost, which measures the total cost inflicted by tobacco on an economy, is composed of the amount of public expenditure that tracks all expenditures incurred by the state and local governments to ensure the financing of care and public policies of prevention and repression related to tobacco [1]. The importance of these health and financial consequences induced by tobacco consumption militates against a "laissez faire" approach, calling for actions on the part of the regulator to reduce tobacco consumption, and therefore its consequences. Indeed, it is worth noting that reducing the number of tobacco-related deaths depends on the ability to reduce tobacco use or consumption [2]. But we find that the policies put in place to control tobacco use have not achieved the desired results [3]. The amount of tobacco smoked has not significantly decreased, nor has the prevalence of Tobacco use. One of the reasons for the ineffectiveness of tobacco control policies cited in previous studies is the lack of consideration of the socioeconomic, demographic, and geographic disparity of smoking, or the lack of understanding of the determinants of smoking. Key characteristics, such as older age, income level, and education level, have

been identified in these studies as the most important determinants of smoking behavior in Sub-Saharan African countries [2, 4, 5].

Therefore, in order to better implement tobacco control policies and plan strategies to limit tobacco use, it would be necessary to identify the factors that influence tobacco use. Socioeconomic, demographic, and geographic disparities in tobacco use should then be explored to ensure prudent allocation of resources for tobacco control initiatives and their effectiveness.

It is in this sense that this paper seeks to identify the socio-economic and demographic factors that influence the decision to consume tobacco products or the characteristics that predispose to smoking behavior in Togo in order to provide public authorities with elements that will enable them to make tobacco control policies and programs more effective.

Literature Review

To analyze the determinants of tobacco, use in Kenya, Magati et al. use the 2014 Kenya Demographic and Health Survey and logistic regression to estimate the likelihood of an individual smoking, based on a set of socioeconomic and demographic characteristics [2]. The results estimate the smoking prevalence rate is 17.3% among men and 0.18% among women in Kenya. This study shows

that among individuals, smoking is influenced by age, marital status, gender, area of residence, region and educational status. Of these factors, gender is the one that appears to be common to many other studies of the determinants of smoking.

It is clear from several other studies that gender has a strong influence on the decision to use or not use tobacco, both in developed and developing countries. Statistics are revealing in this regard, with most showing a clear dominance of smoking prevalence among men over women.

Among other factors that also recur in the determinants of tobacco use is the age of the individual. For this factor, the conclusions are increasingly convergent: tobacco consumption increases with age up to the limit of 59 years in men although among the youngest the level of consumption increases [6]. In his work, Dago observed that age is a factor that really influences tobacco consumption with a very high explanatory power (54.89%) [7]. In addition, a 1997 study of smoking prevalence among men in Chennai, India, found that the highest rate of smoking (64%) was among the illiterate. This prevalence decreased with the number of years of schooling, reaching one-fifth (21%) among those with more than 12 years of education (Gajalakshmi, 2000).

Although there are a large number of studies Fouedjo, 2008; Fernandez et al. Jensen and Nielsen, 1997; Ray, 2000) that address the determinants of tobacco use, and despite the fact that some of the results of the studies done in this area are not convergent; it is clear that socio-economic, environmental and demographic factors influence in some way the decision to use tobacco [2,4,5]. This discrepancy in the results of the studies indicates that it is important to study the determinants of tobacco use in each country or region to really understand the factors that influence the decision to use or not use tobacco in their context. For this reason, the following part of our article will focus on the Togolese context in order to determine the factors that influence smoking.

Prevalence of Tobacco Uses in Togo
The smoking prevalence is estimated at 7.6% of the Togolese population in 2016 by the WHO, compared to 11% in 2013 and 14% in 2010. Recently, in 2019, WHO estimates the smoking prevalence among adult men (15 years and older) at 10.4%, compared to 0.2% among adult women. This prevalence is 7.4% among young boys (13-15 years old) compared to 1.2% among young girls. These statistics show a significant decline in smoking prevalence among women (3.1% in 2010, less than 1% in 2014 and 0.2% in 2019). Although prevalence among men has declined over the years; this decline is not as significant as that seen among women. This prevalence is probably unevenly distributed according to other socioeconomic, demographic, and environmental factors. In this article, we will use data from the EDST 3 survey (Enquête Demographique et de Sante au Togo), which was completed in 2014, to highlight this difference in prevalence. The variables used in our article and their modalities are recorded in Table 1 of our appendix.

Table 1: Smoking prevalence

Characteristic	Smoker, N = 4761	Non-Smoker, N = 13 4801	overall, N = 13 9561	p-value[2]
Region				<0,001
Centrale	74 (3,8%)	1 893 (96%)	1 967 (100%)	
Lomé	48 (2,2%)	2 182 (98%)	2 230 (100%)	
Kara	85 (4,2%)	1 921 (96%)	2 006 (100%)	
Maritime	47 (1,8%)	2 548 (98%)	2 595 (100%)	
Plateaux	100 (4,1%)	2 369 (96%)	2 469 (100%)	
Savane	122 (4,5%)	2 567 (95%)	2 689 (100%)	
Residence				<0,001
Rural	374 (4,3%)	8 405 (96%)	8 779 (100%)	
Urban	102 (2,0%)	5 075 (98%)	5 177 (100%)	
Age				<0,001
[15-24]	44 (0,9%)	4 922 (99%)	4 966 (100%)	
[25-34]	135 (3,2%)	4 071 (97%)	4 206 (100%)	
[35-44]	142 (3,6%)	3 826 (96%)	3 968 (100%)	
[45-59]	155 (19%)	661 (81%)	816 (100%)	
Study				<0,001
None	155 (3,8%)	3 940 (96%)	4 095 (100%)	
Primary	191 (4,5%)	4 019 (95%)	4 210 (100%)	
Secondary	117 (2,3%)	4 945 (98%)	5 062 (100%)	

Higher	13 (2,2%)	576 (98%)	589 (100%)	
Religion				<0,001
No religion	63 (5,3%)	1 130 (95%)	1 193 (100%)	
Other religion	0 (0%)	24 (100%)	24 (100%)	
Christian	145 (1,9%)	7 363 (98%)	7 508 (100%)	
Muslim	112 (4,1%)	2 638 (96%)	2 750 (100%)	
Traditional	156 (6,3%)	2 325 (94%)	2 481 (100%)	
Occupation				<0,001
No	24 (0,6%)	4 166 (99%)	4 190 (100%)	
Yes	452 (4,6%)	9 314 (95%)	9 766 (100%)	
Gender				<0,001
Woman	8 (<0,1%)	9 472 (100%)	9 480 (100%)	
Man	468 (10%)	4 008 (90%)	4 476 (100%)	

[1] n (%)
[2] chi-square tests for independence

Source: Authors, based on EDST 3 survey data

Thus, according to the EDST survey (see Table 2), the gender distribution of respondents indicates that a very small proportion of women use tobacco products. Among all smokers, 1.7% are women, while over 98% are men. According to Table 2, the prevalence among women is also very low (less than 0.1% among women; more than 10% among men). Regarding the level of education, it was found that the majority of smokers in Togo are those who have started or finished secondary school, i.e. 53.42% of tobacco users. Furthermore, it is noted that the prevalence of tobacco use is much higher among those who have only started primary school (4.5%) and decreases according to the level of education, i.e. 2.2% for those who have completed higher education. On the other hand, the number of people who use tobacco is much higher among the employed (95% of all smokers). The prevalence of tobacco use is higher among those who have an occupation (4.6%) than among those who do not. Also, in relation to religion, 33% of tobacco users are followers of traditional religions, followed by Christians (29, 49%). As for the prevalence of smoking within each modality of the "religion" factor, it is noted that the practitioners of traditional religions come first (17.18% of smokers), followed by non-practitioners (16.03%) and Muslims (11.83%). This prevalence is low among the Christian religion practitioners. In relation to age, the prevalence of smoking is very high in the older age groups (45-59 years), and decreases as age decreases.

Socio-Economic and Demographic Determinants and Tobacco Use in Togo

This section will allow us to determine in a concrete way, and based on a given methodology, the determinants of the choice to smoke tobacco in the Togolese context. Much of the empirical work uses single-equation models, including binary models: logit and probit and multinomial models: multinomial logit (Fouedjo, 2008) to analyze the likelihood that a person will or will not use tobacco [2, 4, 5]. Given the characteristics of our dependent variable, which is binary, and the characteristics of the Logit model and the discussion in the previous section, we opt for the Logit models to better estimate the probability that an individual smoke, given his or her own characteristics. It is necessary to indicate, also, that there is an equivalence between the Probit model and Logit, but the software used in our work (R) offers us more analysis with the Logit model.

Specification of The Logit Model

We assume n decision makers who face two alternatives: "smoking" or "not smoking".

The utility of the ne individual for alternative i is written:

$$U_{in} = V_{in} + e_{in} \qquad 1.1$$

with V_{in} the systematic component of utility which is known and e_{in} its random component which is not known.

We can decompose V_{in} as follows: $V_{ln} = Z_{in} + Sn \qquad 1.2$

with Z_{in} the characteristics of the alternative
and Sn the characteristics of individual n .
We can code the alternatives like this:
1 if the individual n chooses to smoke
0 if he decides not to smoke
The Logit model is based on the assumption that e_{in} are identically and independently
distributed according to a Weibull distribution (or extreme value of type 1), which means that
the cumulative of each e_{in} is : $exp\{-exp\{-e_{in}\}\}$
The density of each e_{in} would be: $exp\{\{-e_{in}\}exp\{-exp\{-ein\}\}$
Thus we can find the probability of alternative "1" chosen by decision maker *n* as follows:

$$P_{in} = \Pr\{V_{in} + e_{in} > V_{jn} + e_{jn}, \forall j \in J_n, j \neq i\}$$

$$= \Pr\{e_{jn} < e_{in} + V_{in} - V_{jn}, \forall j \in J_n, j \neq i\}$$

To solve equation, we use the 1 following formulation under the

assumption that $e_{in} = S$. Thus we obtain the following equation, so that the probability of $U_{1n} > U_{0n}$:

$$P_{in} = \Pr\{e_{jn} < S + V_{in} - V_{jn}, \forall j \in J_n, j \neq i\} \Pr\{e_{in} = S\}$$

The event that is sought is the product of the two events or joint probability. According to Bayes' rule, these conditions can be written as the density of e_1n evaluated at S, multiplied by the cumulative distribution of each e_{0n} (sauf e_{1n}) evaluated at $S + V_{1n} - V_{0n}$

$$P_{in} = e^{-s} e^{-e^{-s}} \prod_{\substack{j \in J_n \\ i \neq j}} \{e^{-e^{-(S+V_{in}-V_{jn})}}\}$$

This product is reduced as follows, adding the equality $V_{1n} - V_{1n} = 0$

$$P_{in} = e^{-s} \prod_{\substack{j \in J_n \\ i \neq j}} \{e^{-e^{-(S+V_{in}-V_{jn})}}\}$$

With the assumption that $e_{in} = S$ is true, the previous equation becomes:

$$P_{in} = \int_{s=-\infty}^{\infty} e^{-s} \prod_{\substack{j \in J_n \\ i \neq j}} \{e^{-e^{-(S+V_{in}-V_{jn})}}\} ds = \int e^{-s} e^{-e^{-s \sum_j V_{in}-V_{jn}}} ds$$

The change of variable is:

$$e^{-s} = t \Rightarrow -e^{-s} ds = dt$$

$$(-e^{-s}/e^{-s}) ds = dt/t \Rightarrow ds = -dt/t$$

Thus, equation becomes:

$$P_{in} = \int_0^{\infty} t e^{-t \sum e^{-(V_{in}-V_{jn})}} \left(-\frac{dt}{t}\right)$$

$$P_{in} = \int_0^{\infty} \exp\{-t \sum e^{-(V_{in}-V_{jn})}\} dt$$

And finally

$$P_{in} = \left. \frac{\exp\left\{-t \sum_j e^{-(V_{in}-V_{jn})}\right\}}{\sum_j e^{-(V_{in}-V_{jn})}} \right|_0^{\infty}$$

We finally obtain the usual form of the Logit model:

$$P_{in} = \frac{1}{\sum_j e^{-(V_{in}-V_{jn})}} = \frac{e^{-V_{in}}}{\sum_j e^{-V_{jn}}}$$

The estimated values of the coefficients of the model are not directly interpretable in terms of marginal propensity; only the signs of the coefficients indicate whether the independent variable acts on the dependent variable. The interpretation of the influence of a variable requires the calculation of marginal effects.

Model Estimates and Interpretation of Results

The analysis procedure adopted lets us first check the overall significance of the dependent variables. Then, we will have to determine, for each variable that has an influence on the choice to smoke, the factor that has a high probability of leading the individual to become a smoker. This part will help us to better analyze the results of the estimations of our models. Finally, we will have to do some validation tests of the model.

The results of the significance tests (Table 1 in the appendix) reveal that only the " residence " variable has no influence on the choice of smoking or not smoking. Thus, we have two models, the complete model, containing all the variables, and the reduced model, not containing the variable " residence ". Figure 1 in the appendix, informs us about the characteristics within each variable are more related to smoking behavior and Table 3 gives us the results of the estimates of the two models.

Figure 1: Relative effect of each modality in the choice to smoke
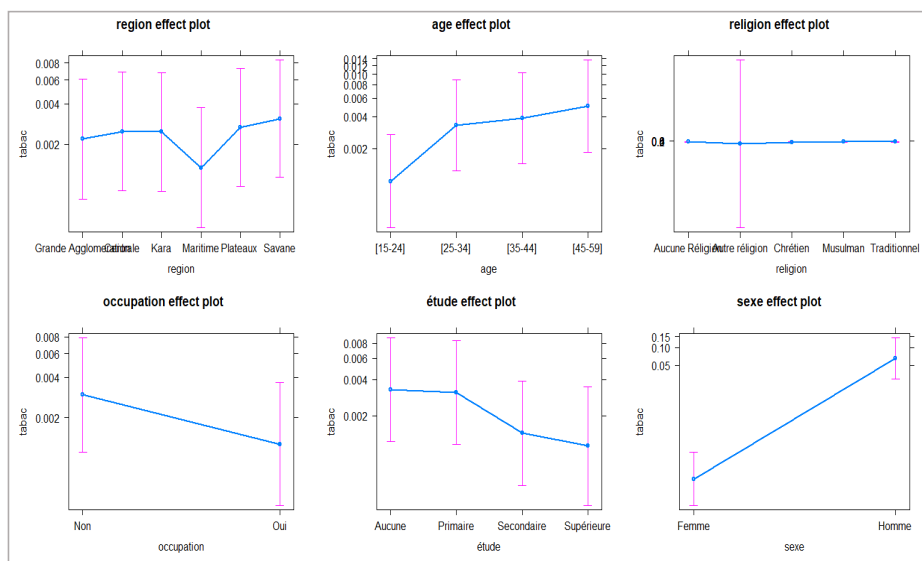
Source: Authors

Table 2: Results of the estimations of the Logit model

Characteristic	Complete model			Reduced model		
	log(OR)1	95% CI1	p-value	log(OR)1	95% CI1	p-value
Region						
Lomé	—	—		—	—	
Centrale	-0,01	-0,51 – 0,49	>0,9	0,20	-0,22 – 0,63	0,4
Kara	0,00	-0,50 – 0,50	>0,9	0,21	-0,21 – 0,63	0,3
Maritime	-0,58	-1,1 – -0,09	0,020	-0,43	-0,88 – 0,02	0,059
Plateaux	0,06	-0,43 – 0,54	0,8	0,27	-0,11 – 0,67	0,2
Savane	0,21	-0,28 – 0,70	0,4	0,43	0,03 – 0,84	0,039
Age						
[15-24]	—	—		—	—	
[25-34]	1,4	1,0 – 1,8	<0,001	1,4	1,0 – 1,8	<0,001
[35-44]	1,5	1,1 – 1,9	<0,001	1,5	1,1 – 1,9	<0,001
[45-59]	1,8	1,4 – 2,2	<0,001	1,8	1,4 – 2,2	<0,001
Religion						
No religion	—	—		—	—	
Other religion	-12		>0,9	-12		>0,9
Christian	-0,62	-1,0 – -0,26	<0,001	-0,64	-1,0 – -0,28	<0,001
Muslim	-0,14	-0,50 – 0,23	0,5	-0,18	-0,54 – 0,18	0,3
Traditional	0,05	-0,30 – 0,41	0,8	0,05	-0,29 – 0,41	0,8
Occupation						
No	—	—		—	—	
Yes	-0,82	-1,3 – -0,36	<0,001	-0,84	-1,3 – -0,38	<0,001
Study						
None	—	—		—	—	
Primary	-0,05	-0,30 – 0,21	0,7	-0,06	-0,32 – 0,20	0,6
Secondary	-0,82	-1,1 – -0,53	<0,001	-0,87	-1,2 – -0,58	<0,001
Higher	-1,1	-1,8 – -0,46	0,001	-1,2	-1,8 – -0,55	<0,001
Residence						
Rural	—	—				
Urban	-0,26	-0,61 – 0,06	0,12			
1OR = Odds Ratio, CI = Confidence interval						

Source: Authors

We Concluded That, In Regard To

1. the occupation of subjects: men who have an occupation are half as likely to smoke as those who do not have an occupation. However, we noted that this difference is not strong enough but is significant and can be explained by the fact that those who are employed have more income to consume tobacco or that the characteristic of the work done by most of those who are employed does not force them not to smoke.

2. educational level: as educational level increases, smoking prevalence decreases. More specifically, the probability of smoking is three times lower for individuals with higher education than for those with no education.

3. age: those between 45 and 59 years of age are almost six times more likely to smoke than those between 15 and 24 years of age. In other words, as age increases, smoking becomes more likely.

4. Region of residence: In contrast to place of residence, belonging to a number of specific regions influences the likelihood

of being a tobacco user or not. Thus, belonging to the northern regions would increase the probability of being a smoker than belonging to the central and southern regions.
5. Religious affiliation: we found that being of the Christian religion would reduce the probability of smoking by almost 2 times, compared to not being a practitioner of any religion. This suggests that smoking bans by religious leaders may be a good tool for tobacco control.
6. to gender, that being a man would increase to more than 5 times the probability of being a smoker than being a woman.

Conclusion
The weak decrease in the use of tobacco in our context, despite the intensification of tobacco control initiatives, led us to study the socio-economic, demographic and geographic disparities in tobacco use in order to ensure a prudent allocation of resources used for tobacco control initiatives. Our results show a disparity in the factors that are likely to influence smoking behavior. Thus, the allocation of resources for tobacco control, including advertising controls, and the overall distribution of human resources for tobacco control, should be based on socioeconomic and demographic dynamics.

References
1. Goodchild M, Nargis N, d'Espaignet E T (2018) Global economic cost of smoking-attributable diseases. Tobacco control 27: 58-64.
2. Magati P, Drope J, Mureithi L, Lencucha R (2018) Socio-economic and demographic determinants of tobacco use in Kenya: findings from the Kenya Demographic and Health Survey 2014. The Pan African Medical Journal 30: 166.
3. Barcola M (2021) The Determinants of the Demand for Tobacco in Togo. International journal of multidisciplinary research and analysis ISSN (print) 2643-9840.
4. Benzarti Y, Carloni D (2016) Do prices respond differently to increases and decreases in consumption taxes. Available at SSRN 2664822.
5. Fernández E, Gallus S, Schiaffino A, López-Nicolás A, La Vecchia C, et al. (2004) Price and consumption of tobacco in Spain over the period 1965–2000. European Journal of Cancer Prevention 13: 207-211.
6. Peltzer K (2011) Determinants of exposure to second-hand tobacco smoke (SHS) among current non-smoking in-school adolescents (aged 11–18 years) in South Africa: results from the 2008 GYTS study. International journal of environmental research and public health 8: 3553-3561.
7. Dago A (2015) La consommation du tabac en Afrique Recherche des facteurs explicatifs en Côte d'Ivoire.pdf. 2015.
8. Atkinson A B, Skegg J L (1973) Anti-smoking publicity and the demand for tobacco in the UK. The Manchester School 41: 265-282.
9. Becker G S, Grossman M, Murphy K M (1991) Rational addiction and the effect of price on consumption. The American Economic Review 81: 237-241.
10. Martinez E, Mejia R, Pérez-Stable E J (2015) An empirical analysis of cigarette demand in Argentina. Tobacco control 24: 89-93.

Appendix

Table 1: Presentation of the variables and their modalities

Variables	Modalities	Tests of Significance
Tobacco	Smoker ; Non-Smoker	Dependent variables
Demographic variables		
Gender	Woman ; Man	0.841*** (0.0056)
Age	[15-24] ; [25-34] ; [35-44] et [45-59]	-0.228*** (0.0265)
Geographic variables		
Region	Lome ; Maritime ; Plateaux ; Centrale ; Kara et Savanes	-0.0422** (0.0192)
Residence	Urban; Rural	-0.0815 (0.0723)
Socio-economic variables		
Religion	Christian; Muslim; Traditional; No religion; Other religion	-0.124*** (0.0275)
Level of education (Study)	Non-Educated; Primary; Secondary; Higher	0.241*** (0.0356)
Occupation	Yes, if they have an occupation; No, if they do not	0.576*** (0.104)

The t-statistics are indicated in parentheses
 ***, ** and * indicate significance of statistics at the 1%, 5% and 10% thresholds
 Source: Authors