



**COLLEGE OF MEDECINE AND HEALTH SCIENCES (CMHS)
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF EPIDEMIOLOGY AND BIostatISTICS**

Dissertation report

**DETERMINANTS OF TOBACCO USE AMONG RWANDANS AGED
15 TO 59 YEARS, DHS 2015.**

**A dissertation submitted to the University of Rwanda in partial fulfillment for the
requirements for the degree of Master of Science in Epidemiology.**

By

MUKANTWARI Enatha-218014245

MSc in Epidemiology

Supervisor: *Prof. Cyprien MUNYANSHONGORE*

Co supervisor: **Dr. Judith MUKAMURIGO**

September 2019

EXECUTIVE SUMMARY

Background: Smoking has not only been associated with adverse effects on health, but has remained as one of the primary causes of preventable illnesses and deaths globally. The fundamental way of discouraging the smoking habit is being aware of the factors influencing smoking. Rwanda has recorded more smoking behaviors among adult males compared to youth and adolescents. However, empirical evidence documenting smoking behaviors among the adults, and most specifically males are limited. The study therefore investigated the determinants of cigarette smoking and the intensity of smoking among adults in Rwanda.

Methods: The study obtained data from the recent Rwanda Demographic and Health Survey DHS 2014/15. A logistic regression model was used to make estimated on the socio-economic and demographic characteristics associated with consumption of cigarette and intensity of smoking among adults aged 15 years and above in Rwanda. To ensure significance of the estimations, bivariate and multivariate analysis were used.

Results: Findings show 3.44 %, the prevalence of tobacco use among adults in Rwanda in 2014-2015 and a higher proportion of then current tobacco users to be male (10.09%) compared to that of female (0.39%). Also the results show that among tobacco users,41.73% smoked on average 3 to 5 cigarettes per day and approximately 10% of them smoked more than ten cigarettes per day . The study findings show that age (OR=20.06; CI at 95%=11.3-35.63; p value=0.0001), being Muslims (OR=2.12; CI at 95%=1.44-3.11; p value=0.0001) and being in service (OR=3.04; CI at 95%=1.44-6.38; p value=0.03) are highly associated with tobacco use among adults in Rwanda. However, findings show that being married (OR=0.59; CI at 95%=0.08-0.46; p value=0.0001, living in Kigali City (OR=0.402; CI at 95%=0.28-0.57; p value=0.0001), having no education (OR=0.19; CI at 95%=0.08-0.46; p value=0.0001) and being in poorest category (OR=0.4; CI at 95%=0.3-0.57; p value=0.0001) are factors that indicated to be less likely to influence tobacco use decision among adults in Rwanda.

Conclusion: Smoking has continuously been associated with high mortality and morbidity cases globally. The study offered recent empirical evidence for public health policies and intervention techniques towards reduction of smoking, and eventually cessation. Findings from the study associated males of all ages, most of those who aged 35 years and above, of the Muslim religion, and being on service with high tobacco use decision. Consequently, the study recommended to put in place public health and community interventions including health promotion on tobacco use negative side effects that focus on working population of all age groups.

Key words: Adult males, cigarette smoking, smoking intensity, logistic regression, Rwanda.

RESUME

Contexte : Malgré les effets néfastes du tabagisme sur la santé, il demeure l'une des principales causes de maladies et de décès évitables dans le monde. La connaissance des facteurs d'influence du tabagisme est essentielle pour décourager l'habitude de fumer. Au Rwanda, cependant, les comportements liés au tabagisme sont comparativement plus associés aux hommes adultes qu'aux jeunes et aux adolescents, les études sur les comportements fumeurs des adultes, principalement des hommes, sont limitées. Cette étude étudie donc les déterminants du tabagisme et de l'intensité du tabagisme chez les adultes rwandais.

Méthodes : Les données proviennent de la plus récente enquête sur la démographie et la santé au Rwanda EDS 2014 / 15. Selon le RDHS de 2014, un modèle de régression logistique a été utilisé pour estimer les caractéristiques socio-économiques et démographiques associées à la consommation de cigarettes et à l'intensité du tabagisme chez les adultes 15 ans et plus au Rwanda. Pour assurer la signification des estimations, une analyse à deux variables et une à plusieurs variables ont été utilisées.

Résultats : Les résultats montrent que 3,44%, la prévalence de la consommation de tabac chez les adultes au Rwanda en 2014-2015 et une proportion plus élevée de consommateurs de tabac actuels (10,09%) que de femmes (0,39%). Les résultats montrent également que parmi les consommateurs de tabac, 41,73% ont fumé en moyenne 3 à 5 cigarettes par jour et environ 10% d'entre elles ont fumé plus de 10 cigarettes par jour. Les résultats de l'étude montrent que l'âge 50 et plus ,(OR = 20.06; IC à 95% = 11.3-35.63; p valeur = 0.0001), étant musulman (OR = 2.12; IC à 95% = 1.44-3.11; p valeur = 0.0001) et étant en les services (OR = 3,04; IC à 95% = 1,44-6,38; valeur p = 0,03) sont fortement associés au tabagisme chez les adultes rwandais. Cependant, les résultats montrent qu'être marié (OR = 0,59; IC à 95% = 0,08-0,46; valeur p = 0,0001, vivant à Kigali City (OR = 0,402; IC à 95% = 0,28-0,57; valeur p = 0,0001), n'avoir aucune éducation (OR = 0,19; IC à 95% = 0,08-0,46; valeur p = 0,0001) et être dans la catégorie la plus pauvre (OR = 0,4; IC à 95% = 0,3-0,57; valeur p = 0,0001) sont des facteurs moins susceptible d'influencer la décision de fumer chez les adultes rwandais.

Conclusion : Par la suite, le tabagisme reste l'une des principales causes de maladies et de décès dans le monde entier. La présente étude vise à fournir des preuves réalistes et récentes des politiques et interventions de Santé Publique visant à réduire le tabagisme et, éventuellement, l'arrêt du tabac. Les résultats de l'étude montrent que les hommes de tous les âges, principalement de 35 ans et plus, musulmans et en service, étaient étroitement associés à la décision de fumer. Par conséquent, l'étude recommande de mettre en place des interventions communautaires et de Santé Publique, y compris la promotion de la santé sur le tabagisme, sur les effets secondaires néfastes qui touchent la population active de tous les groupes d'âge.

Mots clés : Hommes adultes, tabagisme, intensité du tabagisme, régression logistique, Rwanda

DECLARATION

I, Enatha MUKANTWARI, declare that this work on “**Determinants of Tobacco use and smoking intensity among adults in Rwanda, DHS 2015**” was carried by me under the supervision of **Prof Cyprien Munyanshongore** and **Dr. Judith Mukamurigo**.

Enatha MUKANTWARI

Signature

Date:...../...../.....

ACKNOWLEDGEMENT

My sincere gratitude are expressed towards my supervisor, **Prof Cyprien Munyanshongore** and **Dr. Judith Mukamurigo** of the School of Public Health at the University of Rwanda. The door to **Prof Cyprien** has always been opened anytime I was stuck and needed academic consultation about the thesis.

I am moreover grateful for Rwanda Education Board for sponsoring my studies; especially my gratitude goes to the Director of loan at REB who accepted to listen to my desire of studying Master of Science in epidemiology.

Foremost, my profound gratitude is expressed towards my **family and friends** for offering me unfailing support and encouraging me continuously throughout the years of study as well as through the period of writing this academic piece. Indeed the completion of my academic journey would not be a success in their absence. My sincere appreciations.

Enatha MUKANTWARI

ABBREVIATIONS AND ACRONYMS

95%CI :95% Confidence Interval

AOR: Adjusted Odd Ratio

CDC: Center for Diseases Control and Prevention

CPD: Cigarettes Smoked Per Day

CVD: Cardio Vascular Diseases

EAC: East African Community

EAs: Enumeration Areas

FCTC: Framework Convention for Tobacco Control

NCDs: Non-Communicable Diseases

OR: Odd Ratio

RDHS:Rwanda Demographic and Health Survey

RMoH: Rwanda Ministry of Health

RNEC: Rwanda National Ethics Committee

RNIS: Rwanda National Institute of Statistics

SES: Socioeconomic Status

WHO: World Health Organization

LIST OF TABLES

Table 1. Socio-demographic characteristics of respondents (N=19,714)	14
Table 2. Prevalence of tobacco use	16
Table 3. Intensity of tobacco use	16
Table 4. Bivariate analysis: Tobacco use and socio-demographic characteristics of the study population.	18
Table 5. Determinants of tobacco use.....	21

TABLE OF CONTENT

EXECUTIVE SUMMARY	i
RESUME	ii
DECLARATION	iii
ABREVIATIONS AND ACRONYMS	v
LIST OF TABLES	vi
TABLE OF CONTENT	vii
Chap 1. Introduction	1
1.1 Definition of key concepts	1
1.2 Background	1
1.3 Study objectives	3
1.4 Literature review	4
1.5 Conceptual framework	7
Chap 2. Methods and materials	8
2.1 Description of study area	8
2.2 Study design	9
2.3 Specific objectives achievement	9
2.4 Study population	11
2.5 Materials	11
2.6 Policy implication	12
2.7 Ethical considerations	12
Chap 3. Results	13
3.1 Socio-demographic characteristics of the study population, DHS 2014/15 (N=19,697)....	13
3.2 Prevalence of tobacco use	16
3.3 Intensity of tobacco use	16
3.4. Bivariate analysis of tobacco use and socio-demographic characteristics of the study population.....	17
Chap 4. Discussion.....	23
4.1. Tobacco use.....	23
4.2. Factors associated with tobacco use.....	24
4.3. Study limitation	25
Conclusion and recommendations	26

Chapter One. Introduction

1.1 Definition of key concepts

Tobacco user: is anyone who smokes, sniffs or chews cigarette or any tobacco product (1) (2).

RDHS 2014/15 defined a tobacco user as any person who reported to have smoked cigarettes, a pipe or consumed any other tobacco products within 24 hours of survey (3).

Tobacco use is any usual habit of using the tobacco plant leaf and its products through cigarette, pipe and cigar smoking or by tobacco products sniffing, sucking or chewing (4).

Intensity of tobacco use is quantified by the number of cigarettes or other smoking products quantity consumed per day or per year (5)(4). RDHS 2014/15 measured the intensity of tobacco by asking the respondent who agreed to have smoked and the number of cigarettes that had been smoked within the past 24 hours of the survey. The number of cigarettes were classified as 0,1-2,3-5,6-9 &10+ cigarettes (3).

1.2 Background

Tobacco smoking is a significant health behavior that causes more than 20 million early deaths (6). Tobacco use and its exposures are among the leading risk factors for morbidity and mortality of Non-Communicable Diseases NCDs which is currently a global public health threat. (7). WHO reported that 15% (1.1 billion) of global population smoked tobacco in 2015. Reports my WHO link the mortality rate of tobacco use to 7 million people annually (8). Additionally, Owili Po et Al findings associated smoking with 11.5% of the global mortality and 150 million disability-adjusted lives years 'loss in 2015(9); and that about 80% of these persons live loss were from Low-and Middle-income nations in Africa (9). Among these smoking-related live loss, more than 5 million deaths came about because of direct tobacco use or more 600,000 resulted from second-hand smoke exposure (10).

While the use of tobacco in Africa is low (11), the increase of population growth (12) is at the source of a rise of tobacco use where statistics show that around one of every five grown-ups in the locale smokes tobacco (13). The research shows that 37.7% is the highest rate of tobacco use in Sierra Leone whereas the lowest that is found in Sao Tome & Principe is 6.75% (14). Statistics show also that a high proportion of tobacco use is among men contrasted with that of ladies; 21% and

3 % respectively. Researchers findings show also that 18% of the youth (13–15 years of age) in Africa as of now use different forms of tobacco products (15). Among risk factors of tobacco use in Africa is its population demography which is predominated by children and young people (16). Another tobacco use factor that had been documented in Africa is a weak implementation and enforcement of policies on WHO's Framework Convention on Tobacco Control (17). The fundamental influence of the use of tobacco in Africa was associated with school faculty's ignorance of the wellbeing outcomes of tobacco use among others (18). Hence, empirical evidence has linked the years of tobacco use among children who were below seven years of age in Western Africa (19). Rwanda has recorded a 13.3% tobacco prevalence rate among its youth (20), and a 2.3% use among all school personnel in 2014 (16). In addition, empirical evidence on the use of tobacco in 29 African countries among them Rwanda cited the unawareness to the wellbeing results of tobacco use among 66% of all school faculty respondents (16).

RDHS 2014/15 showed that the proportion of male tobacco use is 10% and that of female tobacco users is 2% (3). The same survey report shows that the number of men who smoke cigarettes ascends as they age, from 1% among those of 15-19 years to 16% among those of 40-44 years. In addition to unawareness of the health consequence of tobacco use, Rwanda DHS 2014/15 findings also show that being male, living in South and East Provinces, having no education and be in lowest wealth quintile may be risk factors for cigarettes smoking. Though it might seem like some groups of people do not smoke, it is known that any level of smoking involves general public health concern in light of the secondhand of smoke. Moreover, global NCD reported that tobacco use was estimated at 13% in 2014. This global NCD findings were approximately consistent with findings of WHO Stepwise Rwanda 2012 that showed that prevalence ranges between 15.7% to 38% (21). Also a deep systematic review showed that being female and living in rural could be exposing factor to tobacco use in Rwanda (13).

Noticeably in 2013, Rwanda approved the WHO Framework Convention for Tobacco Control (FCTC), and implemented the Rwanda Tobacco Control Act in 2013(22). The primary aim of the law is to prevent tobacco use, inform and instruct people in general on the outcomes of tobacco use, avert exposure to tobacco smoke, eliminate the unlawful exchange of tobacco products, and motivate smokers to stop. The STEPS study conducted in Rwanda in 2012/13 uncovered the commonness of tobacco use among grown-ups in Rwanda to be 12.9% (23).

Basing on these findings, it is obvious that, though improvements have been made, given guidelines and measures in place; there exists a gap that calls for great attention, more so in determining the degree and causing factors associated with the use of tobacco (24).

It is therefore in the interest of understanding the determinants and intensity of the use of tobacco among adults in Rwanda using the Rwanda Demographic and Health Survey (RDHS) conducted in 2014/15.

1.3. Problem statement

Despite the ratification of the WHO Framework Convention for Tobacco Control (FCTC) and implementation of the Tobacco Control Act in 2013 (22), with the primary aim of preventing the use of tobacco, informing and educating the public about the consequences of tobacco use, preventing exposure to tobacco smoke, eliminating unlawful trade of tobacco products, and motivating smokers to quit; and the existence of empirical evidence as documented by the STEPs survey citing the prevalence of tobacco use among adults in Rwanda as 12.9% (23), it is obvious that, though improvements have been made, given guidelines and measures in place, there is still requirement for more prominent consideration, particularly deciding the levels and determinants of tobacco use (24).

1.4 Study objectives

Overall objective

The objective of the study is to describe patterns and determinants of tobacco use and smoking intensity in Rwanda.

Specific objectives

- (i) To calculate the prevalence rate of tobacco use in adults in Rwanda.
- (ii) To specify the intensity of smoking in Rwandan population aged 15-59 years.
- (iii) To determine factors associated with tobacco use among Rwandans aged 15-59 years.

1.5 Research questions

- What is the prevalence of tobacco use among Rwandan population aged 15 years and above?
- What is the intensity of smoking Rwandan population?
- What are the factors associated with tobacco use among Rwandan population?

1.6 Justification for the study

Basing on DHS comparative report No 31 which showed that understanding factors influencing the smoking status is important to both policymakers and researchers as to efficiently propose policies and interventions that deal with the health burden associated with the cost of smoking that exceeds the smoker himself/herself (25).

We believe that study findings will provide valuable information about factors associated with tobacco use in Rwandan population which will assist policy makers and interventions to successfully prevent Non-Communicable diseases due to Tobacco.

Chapter Two. Literature review

2.1 Empirical literature

Smoking has remained as one of the driving reasons for preventable sicknesses and deaths on the planet. It is also known that the most effective strategy to demoralizing the practice for smoking is understanding the drivers of smoking. In spite of the fact that some strategies and interventions had been put in place to reduce the proportion of people who smoke in Rwanda, Rwandan adults who use cigarettes or any type of tobacco products still remains alarming, for instance, STEP Rwanda 2012 showed that prevalence of tobacco use was at 12.9%. Reports by the WHO proposes the current mortality rate of tobacco use to 8 million, with 80% of them happening among Low-and Middle-Income Countries by 2030 (26). Despite the fact that there has been a decrease in the pervasiveness of smoking in many developed nations, the use of tobacco has remained high in other nations and continue to rise among low- and middle-income countries (27) among them Rwanda, whose tobacco use among grown-ups is evaluated to be 13% (21). Latest statistics indicate that a large portion, approximately 80% of the world's smokers currently live in low-and middle income nations (26). Besides, empirical evidence has indicated a shift of the tobacco epidemic to the developing nations (26), and the trend is expected to cause high degrees of illness and early mortality in nations where populace development is high which permits the capability of tobacco use to be raised and where health care services are least accessible (26).

Furthermore, the CDC study in 2008 showed that health problems of tobacco use are for both users and non-users (28). In this study, CDC showed that, while smoking rates of African American men and women are similar to rates in the general population, African Americans experience greater health consequences associated with smoking, such as lung cancers and CVD (28). And that while African American men smoke less contrasted with non-Hispanic white men, African American men are 34% more likely to develop tobacco-related lung cancers (28).

Without execution of control measures against the use of tobacco, smoking could rise to as high as 22% in the WHO African region by 2030 (29). Clearly the 2013 worldwide weight of ailment report has linked the use of tobacco as among the five explanations for mortality among nations in the East African Community (EAC) (29).

Latest empirical evidence has linked the initiation of smoking and addiction with young age, and has a significant influence on the adults' future smoking behaviors (30). Apart from the health effects and financial challenges, smoking is a leading cause of preventable diseases and deaths. Among the Australian community, smoking is associated with over 15,000 deaths annually, which exceeds the total mortality rates associated with other causes (31). Studies by Foulds J et al suggested that about 1 billion people smoked on a daily basis globally, and out of that number, 47% were adult men, and 12% were adult women. To minimize the health hazards associated with smoking, the WHO and countries including Rwanda ratified and implemented the Framework Convention on Tobacco Control. The STEPS survey conducted in Rwanda in 2012/13 revealed that smoking is still among behavioral factors of NCDs with 12.9% of Rwandans being smokers.

In terms of pragmatic literature, empirical evidence explaining the causative factors of smoking in developed and developing nations have been documented (32) (33) (34) (3) (14) (35). However, there is limited research in Public Health in Rwanda. Besides, available studies are limited in scope (36) (37). Tobacco control measures in Rwanda are specified in Article. N°19/2013 of 25/03/2013, which prohibits tobacco smoking in public places, provides guidance on the advertising of tobacco and tobacco products, labeling and packaging, and offers directions that restrict sale of tobacco products to underage. Even though the law shows a great step towards commitment towards WHO's Framework Convention, it is unfortunate that not much has been done to enforce these policies. In addition, very little effort has been done on educating the public through various platforms among them the media on the harmful effects of smoking. Gaps exist in literature regarding empirical

evidence as well as the driving forces of smoking in the country, which may be associated with low pervasiveness of smoking in the country.

The current study was inspired by three reasons. Firstly, offers some down to earth understanding into the elements affecting smokers to settle on a choice to smoke given that Africa is embracing the tobacco business. Secondly, contemplating over the fact that smoking can be created through socialization and the spread of smoking may be unpreventable. Hence, as a matter of public health policy, there is need to identify factors associated with smoking in order to strategically maintain controllable levels, which may be essential in smoking cessation efforts. Lastly, the health implications on passive smokers is adverse as that of primary smokers irrespective of the fact that the level of primary smokers, which might be the case of Rwanda with relative low prevalence of smoking.

On the other hand, there are some factors that have been documented empirically that affect the decision of a person to smoke. For example, in an investigation by Nguyen (38) (39) gender, age, low education level and working were factors of likelihood to become a smoker in Vietnam and Tanzania. Generally interpersonal behaviors and economic factors were shown as smoking factors in scholarly evidence that examined the decision to stop smoking (40). Example of interpersonal influence was identified by Grenard et al (41) to be linked with smoking decision. To Grenard, parental monitoring, good friend or peer behavior were recognized to be associated with good school academic ranking and provides protection of school aged children to smoke or quit smoking. Similar studies by Rudatsikira et al. (42) provided an estimation on the prevalence of smoking among school-going adolescents in Addis Ababa, using data from a school survey in 2003. The study linked peer pressure; that is having friends who smoked with smoking habits (42), gender (male) and having parents who were smokers were essentially connected with smoking. The perceived ideology that smoking was hurtful to one's wellbeing was fundamentally and adversely connected with being a smoker, a suggestion that learning gained through educational campaigns on the adverse health implications of smoking. As a result, the knowledge of the adverse effects of smoking were key to combating issues affected with the menace. In a similar way, studies by Kent Ranson et al. (43) suggested that the likelihood of smoking between 2007 and 2009 were lower populaces living in burdened neighborhoods in Australia. The existing scholarly evidence, therefore, pinpointed the need to enhance financial conditions in territories that denied as a collective effort towards reduction of smoking among populations.

Studies by Ross et al. (44) linked cigarette costs, smoking confinements and putting limits on youth access to tobacco as having effect on the intake of smoking among adolescents. Scholarly evidence based on logit model linked high cigarette prices with low smoking uptake. High prices increased the impact as individuals faced high risks of becoming addicted to smoking. Empirical evidence from the study additionally proposed that the consistence with youth get to laws could most likely decrease smoking among the adolescent.

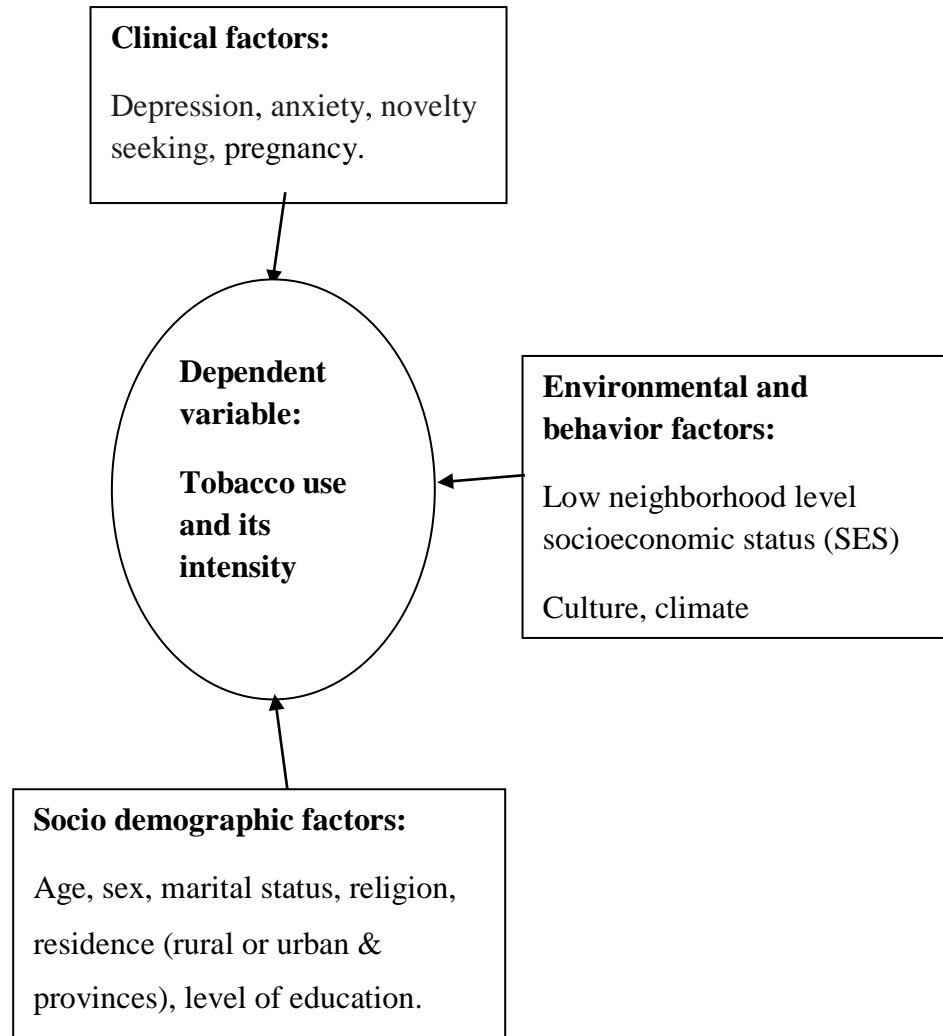
Scholarly evidence has documented more incidences of smoking on males compared to female counterparts (43). Statistics indicate that among populations of smokers, 47% are of the male gender while their counterparts occupy 11%. However, it is important to note that the number of females who smoke in developed nations is increasing and drawing nearer to that of the male sexual orientation. Sexual orientation contrasts in smoking have called upon scholars to include the gender variable in most studies, and this has been linked with three main reasons (43), the general attributes of the customary sex jobs lead to social load against female smoking, traditional sex work principles cause differentiates in close to home qualities prompting pretty much acknowledgment of smoking (for example disobedience among males is more recognized than among women and this causes higher smoking rates) and the effects of sex jobs on the examination of the costs and utility-identified with smoking.

There many influencing factors of tobacco use in Rwanda including culture, climate, education attainment, residence, etc. However, in Rwanda, given that smoking behaviors are more prevalent among male adults than females, scholarly evidence on smoking behaviors among Rwandans are limited. It is therefore in the interest of understanding the determinants and intensity of tobacco use that the study used the 2014 Rwanda Demographic and Health Survey (RDHS) data.

2.2 Conceptual framework

The framework to better understand **factors associated with tobacco use focuses** on:

- **Clinical factors:** Depression, anxiety, novelty seeking, pregnancy
- **Environmental and behavior factors:** Socioeconomic status (SES) culture, climate
- **Socio demographic factors:** Age, sex, marital status, religion, residence (rural or urban & provinces), level of education



Chapter Three. Research methodology

3.1 Description of study area

Rwanda is a nation with a surface area of 26,338 square kilometers located in central Africa, south of the equator, between 1°4' and 2°51'S latitude and 28°63' and 30°54' E longitude. The country is bordered to the North by Uganda, to the East by Tanzania, to the West by the Democratic Republic of Congo, and to the South by Burundi. Economically, the country has been steadily growing by 8%

since 2001, with a Gross Domestic Product (GDP) per capita three times from \$211 to \$719 in 2014. According to the 2012 Fourth Population and Housing Census (RPHC4), Rwanda's population was 10,515,973, and more than half (52%) was composed of the female gender while the male gender occupied the remaining 48%. Projections have shown a steady increase in the population up to 2015.

The country's population density has increased steadily over the years from 183 people per square kilometer in 1978 to 415 in 2012. The population is largely rural as almost 84% reside in rural areas. Almost half of the urban population (49%) resides in the City of Kigali, which is the capital of the country. The population is also essentially young, with approximately 43.4% aging 15 years and below as reported by RPHC4.

There has been a steady increase in the literacy rate in Rwanda, with 77% of the women reported as literate by the latest RDHS surveys compared to their counterparts whose literacy rate stands at 80%. However, the education level of Rwandans is still low as 22% of women and 16% of men did not have education as per the 2010 RDHS, and 68% of women and 72% of men has only attended primary school. 9% of the women population and 11% had attained secondary education, while only 1% of the female population and 2% of the male populations had education levels above secondary school.

3.2 Study design

The study used a cross sectional analytical design that used secondary data from the Rwandan Demographic and Health Survey 2014-2015 (RDHS 2014-2015).

3.3 Specific objectives achievement

(i) To calculate the prevalence rate of tobacco use in adults (males & females) in Rwanda.

- ✓ Prevalence of smoking, female or male is the percentage of women or men ages 15 and over who smoke any form of tobacco, including cigarettes, cigars, pipes or any other smoked tobacco products.

(ii) To specify the intensity of smoking in Rwandan population aged 15-59 years

- ✓ Percent distribution of men or women who smoke cigarettes by number of cigarettes (1-2, 3-5, 6-9 and 10+) smoked in the past 24 hours.

(iii) To determine factors associated with tobacco use among Rwandans aged 15-59 years.

- ✓ A bivariate and multivariate logistic regression model were carried out to identify factors independently associated with current tobacco use. Odd Ratios and Chi-Square test X^2 at P-value ≤ 0.05 were considered as significant level ,95% Confidence Interval was our statistical significance level. We used statistical analysis software STATA (StataCorp 13.0)

Study variables

Dependent variables/Outcome variables: Tobacco use

The 2014/15 RDHS gathered information on the status of cigarette consumption, including the number of cigarettes smoked by respondents who were smokers. Respondents were also asked to state whether they smoked cigarettes. “Yes” responses were documented among respondents who smoked and “No” responses were documented among respondents who did not smoke. The response was also used in discovering the socio-economic and demographic determinants of cigarette smoking among the respondent sample.

Independent variables/ Explanatory variables:

Socioeconomic and demographic characteristics: these are variables contained in the 2014/15 RDHS dataset, they are:

- ✓ sex,
- ✓ age,
- ✓ educational level,
- ✓ employment status,
- ✓ province of residence,
- ✓ areas (urban or rural) of residence)
- ✓ and wealth quantile category
- ✓ Religion
- ✓ Marital status

Analysis of variables

Descriptive analysis of study participants was documented in the form of frequencies and proportions. A binary variable was used to model the primary outcome for the use of tobacco among participants between 15 and 59 years of age. We carried out weighted analysis to determine the

prevalence of tobacco use and we conducted multivariable logistic regression models to identify factors independently associated with current tobacco use. A p-value ≤ 0.05 was considered as significant and 95% CI Confidence Interval were considered. We used STATA (StataCorp 13.0) to conduct data analysis.

3.4 Study population

The study population was made of the total men interviewed (6,217) and of total women interviewed (13,497) from RDHS 2014/15.

Sample size calculation

Sampling technique was a purposeful sampling technique that utilized the most recent data on Rwanda from the Demographic and Health Surveys (DHSs) 2014/15. These surveys are conducted countrywide. Four surveys had been conducted by the Rwanda National Institute of Statistics (RNIS) and Ministry of Health (RMoH). The 2014 RDHS followed a two-stage sampling strategy, with the first being the selection stage where sample points or clusters defined by enumeration areas (EAs) were randomly selected and the second involving the systematic sampling of households (3).

A total of 12,699 households were interviewed. At first, 6,249 eligible men and 13,564 eligible women aged between 15 and 59 years had been identified for the interviews. However, 6,217 men and 13,497 women were successfully interviewed. Hence, response rates were 99.5% for men and 99.5% for female respondents (3). The study also used data from questionnaires that were used to collect data from both genders. All observations from the interviews were used.

Data collection procedure

We registered on <https://www.dhsprogram.com/> to request for RDHS 2014/15 dataset access. Data was used from men and women's surveys in the use of tobacco. All information and information from 6,217 men and 13,497 women interviewed were used as variables of interest.

3.5 Materials

The study used findings from interviewer assisted questionnaire on tobacco use and the number of cigarettes, or any other smoking products smoked by a tobacco user. Questions by the 2014-15 RDHS were aimed at determining the level of tobacco consumption among survey respondents. The

findings indicated that woman and men who were at least 15 years and above, smoked cigarettes or pipes or used any other tobacco products, in line with their background characteristics and maternity status. The number of smoke cigarettes or pipettes or other products were asked too (3).

3.6 Policy implication

We believe that study findings will provide valuable information about elements related with tobacco use in Rwandan population which will assist policy makers and interventions to successfully prevent Non-Communicable diseases due to Tobacco.

3.7 Ethical considerations

Survey protocols were observed and approved by the Rwanda National Ethics Committee (RNEC). Consent was obtained from research participants and information that could be used to identify research participants was not collected. The approval to access the database was obtained through the online registration to DHS Macro. Confidentiality was practiced and utmost care taken to safeguard data, and guarantee established that no information would be traced back to individual participants.

Chapter Four. Results and Discussions

4.1 Results

4.1.1 Socio-demographic characteristics of the study population, DHS 2014/15 (N=19,697)

The findings show that there were 19,714 respondents in our analysis, and 31.54% were males whereas 68.46 % were females. Their mean age was identified to be 29.35 years with Standard Deviation of 10.30 years old.

The proportion of our study respondents decline as their age increases with 20.59 % being in group of 15-19 years old and 3.21 % being over 50 years old.

Also, 63.31% of the participants had attended primary school level. Only a small percentage 2.10% was divorced. A significant part of the overall sampled participants reported to be living in rural area, 74.46% compared to a small part, 25.54% to be living in urban area, and this percentage was more prevalent 25.78% in the Southern province of Rwanda.

The findings show that agriculture –self-employed occupied the biggest percentage of the respondents, 48.73 %.

Additionally, our findings had shown that our respondents 'wealth indexes to be approximately similar, poorest category (17.35 %), poorer (18.19 %), Middle (18.46 %) and rich (19.69 %). The proportion of category of richest had shown to be the biggest 26.31 % compared to others as detailed in **Table 1**.

Table 1. Socio-demographic characteristics of respondents (N=19,714)

Variable	Frequency	Percentage
Gender		
Male	6,217	31.54
Female	13,497	68.46
Age		
15-19	4,060	20.59
20-24	3,476	17.61
25-29	3,283	16.65
30-34	3,087	15.66
35-39	2,129	10.8
40-44	1,718	8.71
45-49	1,333	6.76
50+	632	3.21
Marital status		
Never in union	7,952	40.34
Married	6,901	35.01
Living with partner	3,316	16.82
Widowed	597	3.03
Divorced	414	2.1
No longer living together/Separated	534	2.71
Type of residence		
Urban	5,034	25.54
Rural	14,680	74.46
Province		
Kigali City	2,758	13.99
South	5,082	25.78
West	4,413	22.39
North	3,095	15.7
East	4,366	22.15
Education level		
No education	2,259	11.46
Primary	12,480	63.31
Secondary	4,221	21.41
Higher	754	3.82
Religion		
Catholic	8,268	41.98
Protestant	8,276	42.02
Adventist	2,344	11.9
Jehovah Witness	146	0.74
Muslim	502	2.55

Traditional	4	0.02
No religion	148	0.75
Other	6	0.03
Occupation		
Not working	2,767	14.05
Professional/Technical/managerial	702	3.56
Clerical	89	0.45
Sales	1,567	7.96
Agriculture-self employed	9,599	48.73
Agriculture-employee	2,068	10.5
Household and domestic	732	3.72
Services	434	2.2
Skilled manual	1,002	5.09
Unskilled manual	732	3.74
Wealth Index		
Poorest	3,421	7.35
Poorer	3,585	8.19
Middle	3,640	8.46
Rich	3,881	9.69
Richest	5,187	6.31

4.1.2 Prevalence of tobacco use

Table 2 presents the prevalence of tobacco use which shows that 3.44% of the respondents reported being current tobacco users.

Table 2. Prevalence of tobacco use

Smoking status	Frequency	Percentage
No	19,032	96.56
Yes	679	3.44

4.1.3 Intensity of tobacco use

The findings from Table 3 show that among tobacco users, 41.73 % smoked on average 3 to 5 cigarettes per day. Approximately 10 percent of the tobacco users reported to have smoked more than ten cigarettes per day as shown in **Table 3**.

Table 3. Intensity of tobacco use

Number of cigarettes smoked in last 24 hours	Frequency	Percentage
1 to 2	191	29.52
3 to 5	270	41.73
6 to 9	68	10.51
10+	63	9.74

4.1.4. Bivariate analysis of tobacco use and socio-demographic characteristics of the study population.

Bivariate result show a higher proportion of current tobacco users were male (10.09%) compared to that of female (0.39%) ($P < 0.0001$).

As shown in Table 4, a higher proportion of tobacco users whose age of over 50 years old (19.3%) compared to those aged 15-19 years old (0.49%) ($P < 0.0001$).

On the other hand, the study revealed that a higher proportion of tobacco users whose region were from Southern Province (4.63%) compared to those living in Western Province (1.81%) ($P < 0.0001$).

The findings show that a higher proportion of tobacco users (6.33%) were living with partners compared to those who were never in union (1.87%) ($P < 0.0001$).

These results also show that a higher proportion who had no education at all (5.89%) smoke more than those who had a higher education level (1.06%) ($P < 0.0001$).

Moreover, findings show that those without religion (13.51 %) smoke more than those who were protestants (1.78%) ($P < 0.0001$). Also findings show that those people who worked in field with unskilled manual (11.94 %) smoke more than those who did not have occupation (0.43%) ($P < 0.0001$).

Finally, the study findings show that people in the poorest category of wealth index (4.94%) smoked more than those in richest category (2.47%) ($P < 0.0001$).

Table 4. Bivariate analysis: Tobacco use and socio-demographic characteristics of the study population.

Explanatory variables	Smoking status		P-Value
	Yes[%(n)]	No[%(n)]	
1.Gender			0.0001
Male	10.09((627))	89.91(5,590)	
Female	0.39(52)	99.61(13,442)	
2.Age group			0.0001
15-19	0.49(20)	99.5(4,039)	
20-24	1.44(50)	98.56(3,422)	
25-29	3.66(120)	96.34(3,162)	
30-34	4.08(126)	95.92(2,960)	
35-39	4.56(97)	95.44(2,032)	
40-44	4.48(77)	95.52(1,641)	
45-49	5.03(67)	94.97(1,266)	
50+	19.3(122)	80.7(510)	
3.Province of residence			0.0001
Kigali city	3.66(101)	96.34(2,656)	
Southern Province	4.63(236)	95.37(4,846)	
Western Province	1.81(80)	98.19(4,332)	
Northern Province	3.1(96)	96.9(2,999)	
Eastern Province	3.83(167)	96.17(4,199)	
4.Type of area of residence			0.955
Urban	3.46(174)	96.54(4,859)	
Rural	3.44(505)	96.56(14,173)	
5.Marital status			0.0001
Never in union	1.87(149)	98.13(7,802)	
Married	3.93(271)	96.07(6,628)	
Living with partner	6.33(210)	93.67(3,106)	
Widowed	2.51(15)	97.49(582)	
Divorced	3.86(16)	96.14(396)	
Nolongerliving together/Separated	3.37(18)	96.63(516)	
6.Education level			0.0001
No education	5.89(133)	94.11(2,126)	
Primary	3.8(474)	96.2(12,004)	
Secondary	1.52(64)	98.48(4,156)	
Higher	1.06(8)	98.94(746)	
7.Religion			0.0001
Catholic	5.07(419)	94.93(7,848)	

Protestant	1.78(147)	98.22(8,129)	
Adventist	1.79(42)	98.21(2,301)	
Jehovah Witness	2.05(3)	97.95(143)	
Muslim	9.36(47)	90.64(455)	
Traditional	0	100(4)	
No religion	13.51(20)	86.49(128)	
Other	0	100(6)	
8.Occupation			0.0001
Not working	0.43(12)	99.57(2,754)	
Professional/Technical/managerial	1.99(14)	98.01(688)	
Clerical	2.25(2)	97.75(87)	
Sales	2.17(34)	97.83(1,532)	
Agriculture-self employed	3.01(289)	96.99(9,309)	
Agriculture-employee	5.37(111)	94.63(1,957)	
Household and domestic	1.64(12)	98.36(720)	
Services	6.68(29)	93.32(405)	
Skilled manual	8.78(88)	91.22(914)	
Unskilled manual	11.94(88)	88.06(649)	
9.Wealth index			0.0001
Poorest	4.94(169)	95.06(3,252)	
Poorer	3.63(130)	96.37(3,454)	
Middle	3.93(143)	96.07(3,496)	
Richer	2.81(109)	97.19(3,772)	
Richest	2.47(128)	97.53(5,058)	

4.1.5 Multivariate analysis: factors associated with tobacco use

Logistic regression model was used in multivariate analysis to determine the strength of the determinants which predict the likelihood of tobacco use among adults aged 15 years and above in Rwanda.

Looking at age groups, those in age group 50 years and above were 20.06 times more likely to be tobacco users (OR=20.06; CI at 95%=11.3-35.63; p value=0.001) compared to young people.

Adults from Kigali City were less likely to be tobacco users (OR=0.402; CI at 95% =0.28-0.57; p value=0.0001) than adults from other Provinces.

Married adults were less likely to be tobacco users (OR=0.59; CI at 95%=0.44-0.80; p value=0,0001) compared to those who were never in union.

Adults with no education level were less likely to be tobacco users (OR=0.19; CI at 95%=0.08-0.46; p value=0.0001) compared to those with higher education level.

Muslim adults were 2,12 times more likely to be tobacco users (OR=2,12; CI at 95%=1.44-3,11; p value=0,0001) compared to protestant adults.

Adults in services were 3,04 times more likely to be tobacco users (OR=3,04; CI at 95%=1,44-6,38; p value=0,03) compared to non-working adults.

Poorest adults were less likely to be tobacco users (OR=0.4; CI at 95%=0.3-0.57; p value=0.0001) than richest adults.

Table 5. Determinants of tobacco use

Explanatory variables	smoking status		Full model			Reduced model		
	Yes[%(n)]	No[%(n)]	OR	[95% CI]	P-Value	OR	[95% CI]	P-Value
1.Gender					0.0001			0.0001
Female(=Reference group)	0.39(59)	99.61(13,442)		1			1	
Male	10.09(62)	89.91(5,590)	0.34	[0.02-0.04]	0.0001	0.03	[0.02-0.04]	0.0001
2.Age group					0.0001			0.0001
15-19(=Reference group)	0.49(20)	99.5(4,039)		1			1	0.0001
20-24	1.44(50)	98.56(3,422)	2.95	[1.75-4.96]	0.0001	3.25	[1.89-5.60]	0.0001
25-29	3.66(120)	96.34(3,162)	7.66	[4.76-12.33]	0.0001	8.58	[5.07-14.53]	0.0001
30-34	4.08(126)	95.92(2,960)	8.59	[5.35-13.81]	0.0001	10.48	[6.06-18.12]	0.0001
35-39	4.56(97)	95.44(2,032)	9.64	[5.93-15.64]	0.0001	15.53	[8.81-27.37]	0.0001
40-44	4.48(77)	95.52(1,641)	9.47	[5.77-15.54]	0.0001	14.3	[7.97-25.62]	0.0001
45-49	5.03(67)	94.97(1,266)	10.68	[29.84-78.20]	0.0001	16.29	[8.96-29.62]	0.0001
50+	19.3(122)	80.7(510)	48.3	[29.84-78.20]	0.0001	20.06	[11.3-35.63]	0.0001
3.Province of residence					0.0001			0.0001
Western Province(=reference group)	1.81(80)	98.19(4,332)		1			1	
Southern Province	4.63(236)	95.37(4,846)	1.27	[1.005-1.61]	0.045	1.09	[0.8-1.49]	0.558
Kigali City	3.66(101)	96.34(2,656)	0.485	[0.36-0.65]	0.0001	0.402	[0.28-0.57]	0.0001
Northern Province	3.1(96)	96.9(2,999)	0.84	[0.63-1.11]	0.23	0.71	[0.50-1.02]	0.066
Eastern Province	3.83(167)	96.17(4,199)	1.045	[0.81-1.34]	0.72	0.8	[0.58-1.11]	0.192
4.Marital status					0.0001			0.0001
Never in union(=reference group)	1.87(149)	98.13(7,802)		1			1	
Married	3.93(271)	96.07(6,628)	2.14	[1.74-2.62]	0.0001	0.59	[0.44-0.80]	0.0001
Living with partner	6.33(210)	93.67(3,106)	3.54	[2.85-4.38]	0.0001	1.16	[0.87-1.54]	0.301
Widowed	2.51(15)	97.49(582)	1.34	[0.78-2.31]	0.27	1.28	[0.66-2.48]	0.452
Divorced	3.86(16)	96.14(396)	2.1	[1.24-3.55]	0.005	1.24	[0.66-2.33]	0.495
No longer living together	3.37(18)	96.63(516)	1.82	[1.11-3.00]	0.01	1.14	[0.62-2.06]	0.665
5.Education level					0.0001			0.0001
Higher(=reference group)	1.06(8)	98.94(746)		1			1	0.0001
Primary	3.8(474)	96.2(12,004)	0.63	[0.51-0.76]	0.0001	0.83	[0.66-1.05]	0.128
Secondary	1.52(64)	98.48(4,156)	0.24	[0.180-0.33]	0.0001	0.58	[0.40-0.85]	0.006
No education	5.89(133)	94.11(2,126)	0.17	[0.08-0.35]	0.0001	0.19	[0.08-0.46]	0.0001
6.Religion					0.0001			0.0001
Protestant(=reference group)	1.78(147)	98.22(8,129)		1			1	
Catholic	5.07(419)	94.93(7,848)	0.33	[0.27-0.40]	0.0001	0.39	[0.32-0.49]	0.0001

Adventist	1.79(42)	98.21(2,301)	0.34	[0.24-0.47]	0.0001	0.34	[0.24-0.48]	0.0001
Jehovah Witness	2.05(3)	97.95(143)	0.39	[0.12-1.23]	0.11	0.55	[0.16-1.82]	0.331
Muslim	9.36(47)	90.64(455)	1.93	[1.41-2.65]	0.001	2.12	[1.44-3.11]	0.0001
Traditional	0	100(4)	0			0	0	
No religion	13.51(20)	86.49(128)	2.92	[1.80-4.73]	0.0001	1.04	[0.6-1.82]	0.865
Other	0	100(6)	0			0	0	
7.Occupation					0.0001			0.01
Not working(=reference group)	0.43(12)	99.57(2,754)		1			1	
Professional/Technical/managerial	1.99(14)	98.01(688)	4.67	[2.15-10.14]	0.0001	2.12	[0.88-5.07]	0.091
Clerical	2.25(2)	97.75(87)	5.27	[1.16-23.93]	0.03	1.75	[0.33-9.15]	0.5
Sales	2.17(34)	97.83(1,532)	5.09	[2.62-9.86]	0.0001	1.61	[0.79-3.29]	0.185
Agriculture-self employed	3.01(289)	96.99(9,309)	7.12	[3.99-12.71]	0.0001	1.44	[0.76-2.72]	0.26
Agriculture-employee	5.37(111)	94.63(1,957)	13.01	[7.15-23.68]	0.0001	2.35	[1.22-4.55]	0.01
Household and domestic	1.64(12)	98.36(720)	3.82	[1.71-8.54]	0.001	2.22	[0.93-5.28]	0.07
Services	6.68(29)	93.32(405)	16.43	[8.31-32.46]	0.0001	3.04	[1.44-6.38]	0.003
Skilled manual	8.78(88)	91.22(914)	22.09	[12.03-40.57]	0.0001	2.22	[1.14-4.31]	0.018
Unskilled manual	11.94(88)	88.06(649)	31.11	[16.92-57.22]	0.0001	0.39	[2.05-7.68]	0.0001
8.Wealth Index					0.0001			0.012
Richest(=reference group)	2.47(128)	97.53(5,058)		1			1	
Poorer	3.63(130)	96.37(3,454)	0.72	[0.57-0.91]	0.007	0.7	[0.54-0.92]	0.012
Middle	3.93(143)	96.07(3,496)	0.78	[0.62-0.98]	0.039	0.79	[0.6-1.03]	0.082
Richer	2.81(109)	97.19(3,772)	0.55	[0.43-0.71]	0.0001	0.48	[0.36-0.64]	0.0001
Poorest	4.94(128)	95.06(3,252)	0.48	[0.38-0.61]	0.0001	0.41	[0.3-0.57]	0.0001

4.2 Discussion

4.2.1 Tobacco use

The study findings show that 3.44% of the RDHS 2014/15 respondents were currently using tobacco. This is less than the smoking prevalence of 12.9% in Rwandan population as shown in the Rwanda STEP survey 2012/13 (23). The prevalence of tobacco use was also slightly lower in the STEPS as compared to the 2014 global NCD by WHO estimate of current tobacco use to be at 13% (21).

Low prevalence found in this study justifies big achievement of Rwanda government, but, it indicates that there is still need to continuing initiatives that target youth school population whose tobacco use prevalence of 2,3% (16).

Comparing this study prevalence of 3.44 % shows that Rwanda has the lowest rate of tobacco use level among sub-Saharan African countries (43) as well as within the East African region, including Uganda (9.6%) and Ethiopia (4.2%). This study prevalence is even lower than the Sao Tome & Principe prevalence of 6.75% (14) that had been reported to be the lowest in the region.

Nevertheless, this prevalence is slightly low, it is still important to renew industrious implementation of the WHO FCTC and the Tobacco Control Act (TCA) by all stakeholders (3), (17). For example, the authorization of smoke-free zones and checking for adequacy of approaches is still needed (17). Additionally, reinforcement of health promotion education to address absence of comprehension among the overall public on the impacts of tobacco use on chronic diseases, for example, cancer, keeps on being an issue (16).

Furthermore, as it is known that any level of smoking involves general wellbeing concern in light of the fact that smoking affects both user and non-user (25). As this has been shown by the CDC in 2008, that the smoking rates of African American men and women were similar to rates in general population, African American experienced greater health consequences including lung cancers and Cardio-Vascular Diseases CVCs in 2008. This study of CDC 2008 reported that, while African American men smoke less contrasted with non-Hispanic white men, African American were 34% more likely to develop tobacco-related lung cancers (28).

Also the findings show that proportion of men smokers is 10.09% whereas female smokers rate is 0.39 %, which is almost similar to Rwanda DHS 2014/15 of 10% and 2% for males and females

respectively (3). Most of studies attribute this high proportion of male population to be a phenomenon of tobacco industry that target men by depicting smoking as an activity for the male gender linked with advantages among them enhanced sexual ability. Besides, the community approach towards smoking among the female population is more tolerant (8), (16), (43). The recognition of sex differences among tobacco users is essential due to its ability to guide the prioritization of tobacco control interventions in a way that reaches affected groups (10), (17). Among the strategic intervention to be implemented is tobacco messaging and cessation as per the targeted sex (8), (17).

4.2.2 Factors associated with tobacco use

The study findings show that age, mostly age group 50+, being Muslims, and being in service was highly associated with the use of tobacco among adults in Rwanda. However, findings show that being married, living in Kigali City, having no education and being in poorest category to be factors that are less likely to influence tobacco use decision among adults in Rwanda.

Most of the smokers were cited as being in the age group 35-39 years and beyond, (OR=20.06; CI at 95%=11.3-35.63; p value=0.0001). The results are consistent with some other current studies, their evidence linked smoking and smoking addition with young age and strongly influenced future habits of smoking (30).

On the other hand, high prevalent rate of tobacco use among younger populations was influenced by peer pressure, which was through having a smoking friend, being male, and having one of both parents as smoker (42). Subsequently dealing with the use of tobacco at this age group including increasing knowledge of harmful impact of smoking among this age group is key in combatting the menace that might be caused by tobacco use (42).

Moreover, strengthened enforcement of the FCTC and TCA that includes punishing lawfully the provision of tobacco to youth and the forbidding of tobacco publicizing, promotion and sponsorship would be the best strategic policy to protect youth to become smokers when they grow.

The findings show that having low education level, and being active works to be statistically significant predictor of smoking status. Specifically, first, the results show that adults with no instruction-level were less inclined to be tobacco users (OR=0.19; CI at 95%=0.08-0.46; p value=0.0001) contrasted with those with advanced education level. Second, grown-ups in services were multiple times bound to be tobacco users (OR=3,04; CI at 95%=1,44-6,38; p value=0,03)

compared to not working adults. Third, Adults in services were multiple times bound to be tobacco users (OR=3,04; CI at 95%=1,44-6,38; p value=0,03) compared to not working adults. And poorest adults were less inclined to be tobacco users (OR=0.4; CI at 95%=0.3-0.57; p value=0.0001) than richest adults. The findings are consistent with the study findings of Nguyen where the Nguyen showed that factors influencing smoking may be linked to interpersonal characteristics or economic factors (39), (41), (42)

The study findings show also that Muslim adults were 2,12 times more likely to be tobacco users (OR=2,12; CI at 95%=1.44-3,11; p value=0,0001) compared to protestant adults. And that married adults were less likely to be tobacco users (OR=0.59; CI at 95%=0.44-0.80; p value=0,0001) compared to those who were never in union. The findings indicate that there is to target this groups with awareness and health promotion education on the side effect of smoking for both users and non-users.

4.2.3. Study limitation

The subject surrounding the use of tobacco is very sensitive, and questions regarding its usage may cause stigma. Hence, the frequency of use and type of tobacco used might be subjected to response bias; however, the data was as per the standards standard for the Demographic Health Survey. This was likely also not helped by face-to-face interviews that may further bias responses.

The use of tobacco is self-reported and refers to periods preceding to the study, and hence subjecting responses to recall bias.

Cross-sectional designs can draw associations but cannot assume causality, which was a limitation to the current cross-sectional nature of the study design.

The DHS survey had limitations in that it did not collect other data established in literature such as the predisposing factors presented by tobacco use by other family members.

Chapter Five. Conclusion and recommendations

5.1 Conclusion

Prevalence of tobacco use in Rwandan population was 3.44% according to RDHS 2014/2015 and higher proportion of current tobacco users were male (10.09%) compared to that of female (0.39%) ($P < 0.0001$).

Among tobacco users, 41.73 % smoked on average 3 to 5 cigarettes per day. And approximately 10 percent of the tobacco users reported to have smoked more than ten cigarettes per day.

The study findings show ages, mostly being in age group 35 years and above, being Muslims, and being on service were highly associated with tobacco use decision. Therefore, the study recommends to put in place public health and community interventions including health promotion on tobacco use negative side effects that focus on working population of all age groups. On the other hands, findings show that being married, living in Kigali City, having no education and being in poorest category to be factors that are less likely to influence tobacco use decision among adults in Rwanda.

5.2 Recommendations

There is need to control adherence to the TCA by bars and restaurants in Rwandan cities including Kigali which is not optimal and there is need to be strengthened TCA.

There is need to put in place public health and community interventions including health promotion on tobacco use side effects that focus on working population of all age groups, those who are Muslims and living in other provinces than Kigali City.

There is need to integrate treatment for tobacco reliance on health service delivery at all levels. Making such services accessible with other populace based measures could help accomplish a tobacco-free Rwanda.

Finally, there is need of deep research on TCA policy implementation, the knowledge of Rwandan population on tobacco use side effects and trends / uptake of emerging tobacco products including e-cigarettes mostly among young people.

References

1. Zhang J, Lin X. Comparison of clinical features between non- smokers with COPD and smokers with COPD : a retrospective observational study. 2014;57–63.
2. OR OTHER TOBACCO USERS : 2020;6–7.
3. Survey H. Rwanda. 2014.
4. Use T. Tobacco Use.
5. Frequency RB. HHS Public Access. 2015;84(9):549–58.
6. Alberg AJ, Shopland DR, Cummings KM. Epidemiology in History The 2014 Surgeon General ' s Report : Commemorating the 50th Anniversary of the 1964 Report of the Advisory Committee to the US Surgeon General and Updating the Evidence on the Health Consequences of Cigarette Smoking. 2014;179(4):403–12.
7. Merianos AL, Dixon CA, Mahabee- EM. HHS Public Access. 2018;31(2):161–6.
8. Report WHO, The ON, Tobacco G. Monitoring tobacco use and prevention policies. 2017.
9. Owili PO, Muga MA, Pan W, Kuo H. Indoor secondhand tobacco smoke and risk of under-five mortality in 23 sub-Saharan Africa countries : A population based study and meta-analysis. 2017;08:1–17.
10. Collaborators T. Estimating smoking prevalence and attributable disease burden in 195 countries and territories , 1990-2015 : a systematic analysis from the Global Burden of Disease Study 2015 . Research in Context. 2015;1–22.
11. Ng M, Freeman MK, Fleming TD, Robinson M, Dwyer-lindgren L, Thomson B, et al. Smoking Prevalence and Cigarette Consumption in 187 Countries, 1980-2012. 2014;98121(2):183–92.
12. Sharealike CCA-, By-nc-sa CC, Commons C, By-nc-sa CC. WHO global report on trends in

prevalence of tobacco smoking 2000-2025 , second edition ISBN 978-92-4-151417-0
 Suggested citation : Suggested citation : WHO report on trends in prevalence of tobacco
 smoking second WHO global report on trends in prevalence of tobacco smoking
 Health Organization ; second Geneva : edition . World Geneva : World Health Organization ;
 © World Health Organization 2018.

13. Brathwaite R, Addo J, Smeeth L, Lock K. A Systematic Review of Tobacco Smoking Prevalence and Description of Tobacco Control Strategies in Sub-Saharan African Countries ; 2007 to 2014. 2015;1–16.
14. Sreeramareddy CT, Pradhan PM, Sin S. Prevalence , distribution , and social determinants of tobacco use in 30 sub-Saharan African countries. 2014;1–13.
15. THE WHO FRAMEWORK CONVENTION ON TOBACCO CONTROL : 10 YEARS OF IMPLEMENTATION IN THE AFRICAN REGION.
16. Agaku IT, Filippidis FT. Prevalence , determinants and impact of unawareness about the health consequences of tobacco use among 17 929 school personnel in 29 African countries. 2014;
17. Tumwine J. Implementation of the Framework Convention on Tobacco Control in Africa : Current Status of Legislation. 2011;4312–31.
18. (ITC) Four Country Survey. 2006;65–70.
19. Blum RW, Ph D. Youth in Sub-Saharan Africa. 2007;41:230–8.
20. Convention WHO, Control T, Fctc WHO. WHO report on the global tobacco epidemic, 2017 Country profile. 2017;
21. Risk D, Report F. REPUBLIC OF RWANDA Rwanda Non-communicable. 2015;(November).
22. Lois AAL. Ibirimo / Summary / Sommaire. 2013;
23. Health MOF. Non COMMUNICABLE DISEASES Policy. 2015;(March).

24. Husain MJ, English LM, Ramanandraibe N, States U. HHS Public Access. 2017;
25. Ansara DL. TOBACCO USE BY MEN AND WOMEN IN 49 COUNTRIES WITH DEMOGRAPHIC AND HEALTH SURVEYS DHS COMPARATIVE REPORTS 31. 2013;(July).
26. Report WHO, Mpower T. fresh and alive. 2008;
27. Report WH. The Wo World rld Health Report 2004 changing history. 2005;
28. Manuscript A. NIH Public Access. 2013;125(1):171–84.
29. Anderson CL, Becher H, Winkler V. Tobacco Control Progress in Low and Middle Income Countries in Comparison to High Income Countries. 2016;
30. 15 1400. 2017;(202):2015–7.
31. The burden of disease and injury in Australia 2003. 2003;
32. Guindon GE. The impact of tobacco prices on smoking onset : a methodological review. 2013;1–15.
33. Smet B, Maes L, Clercq L De, Haryanti K, Winarno RD. Determinants of smoking behaviour among adolescents in Semarang , Indonesia. 1999;186–91.
34. Lewis S, Mcneill A, Gilmore A, Britton J. Smoking uptake and prevalence in Ghana. 2009;365–70.
35. Ibrahim BS, Usman R, Niyang M, Gobir B, Okon UA. Prevalence and Determinants of Tobacco use in Nigeria: A one year review, 2014. 2017;(March):3–8.
36. Kanyoni M, Gishoma D, Ndahindwa V. Prevalence of psychoactive substance use among youth in Rwanda. ??? [Internet]. 2015;1–8. Available from: ???
37. Nahimana M, Nyandwi A, Muhimpundu MA, Olu O, Condo JU, Rusanganwa A, et al. A population-based national estimate of the prevalence and risk factors associated with hypertension in Rwanda : implications for prevention and control. 2018;1–11.

38. Paper W, No S, Phuong T, Ngo T, Minh T, Nguyet NT, et al. *D e p o c e n*. 2008;
39. Tingum BEN, Ofeh MA, Tafah A. Socio-Economic Determinants of Tobacco use in Tanzania: Estimates using Demographic Health Survey. 2017;17(4).
40. Yuda M. The impacts of recent smoking control policies on individual smoking choice : the case of Japan. *Health Econ Rev* [Internet]. 2013;3(1):1. Available from: *Health Economics Review*
41. Grenard JL, Guo Q, Jasuja GK, Unger JB, Gallaher PE, Sun P, et al. Influences affecting adolescent smoking behavior in China. 2006;(May).
42. Zhu C, Cai Y, Ma J, Li N, Zhu J, He Y, et al. Predictors of Intention to Smoke among Junior High School Students in Shanghai , China : An Empirical Test of the Information-Motivation-Behavioral Skills (IMB) Model. 2013;8(11):1–7.
43. Jha P, Ranson MK, Nguyen SN, Yach D. Estimates of Global and Regional Smoking Prevalence in 1995 , by Age and Sex. 2002;92(6):1995–9.
44. Ross H. Youth Smoking Uptake Progress : Price and Public Policy Effects Research Paper Series , No . 11. 2001;(11).