

1 **Tobacco use and associated factors among Rwandan youth aged 15-34 years: Findings**  
2 **from a nationwide survey, 2013**

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11 **Abstract**

12 **Introduction**

13 Tobacco use is the single most preventable cause of death in the world. The objective of this  
14 study was to determine the prevalence of current tobacco use and identify associated factors  
15 among Rwandans aged 15-34 years.

16 **Methods**

17 This cross-sectional analytical study analysed secondary data collected during the nationally  
18 representative Non-Communicable Disease Risk Factors Surveillance survey conducted in 2013  
19 to explore the prevalence of tobacco use in Rwanda and identify factors associated with tobacco  
20 use. This study analysed data collected from 3,900 youth participants (15-34 years old), selected  
21 using multistage cluster sampling technique. The overall proportion of current smokers, as well  
22 as demographic and socioeconomic characteristics of the sample were determined and

23 multivariable logistic regression employed to identify factors independently associated with  
24 current tobacco use.

## 25 Results

26 The prevalence (weighted) of current tobacco use (all forms) was 8% (95%CI: 7.08-9.01).  
27 Prevalence statistically significant was found in the following group: higher prevalence was  
28 found among males, young adults aged 24-34, youth with primary school education or less, those  
29 from Southern province, people with income (work in public, private organizations and self-  
30 employed) and young married adults.

31 There was no statistically significant difference in prevalence of tobacco use between  
32 participants from urban or rural areas (7.8% vs. 8.0%). Factors that were found to be associated  
33 with current tobacco use through the multivariate analysis included being a male, aged 25 years  
34 and above, having an income, and residing in Eastern, Kigali City and Southern Province  
35 compared to Western province.

## 36 Conclusion

37 The association between smoking and sociodemographic characteristics among Rwandan youth  
38 identified in this study provides an opportunity for policy makers to tailor future policies, and  
39 implement coordinated, high-impact interventions to prevent initiation of tobacco use among the  
40 youth.

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## 43 Introduction

44 Tobacco use is the single most preventable cause of death in the world[1]. The World Health  
45 Organization (WHO) estimates that there are nearly one billion smokers globally[2]. Every year,

46 smoking accounts for more than 7 million preventable deaths worldwide[3]. The annual deaths  
47 are expected to reach 8 million by 2030 if no cost effectiveness measures to reduce smoking are  
48 initiated [4]. Approximately 80% of all the tobacco attributable deaths occur in low-middle  
49 income countries (LMICs)[5] such as Rwanda where tobacco use among adults is estimated to be  
50 13%[6].

51 Without implementation and enforcement of effective tobacco control policies, smoking  
52 prevalence could increase to as high as 22% globally and in the WHO African region by 2030  
53 [7]. The 2013 global burden of disease report estimates that deaths from tobacco use are among  
54 the top five causes of mortality in the East African Community (EAC) countries; Burundi,  
55 Kenya, Rwanda, South Sudan, Tanzania, and Uganda [8].

56 Current evidence shows that the path towards smoking and smoking addiction starts at a young  
57 age and strongly influences future adult smoking behaviour [9-10]. In Rwanda, no studies have  
58 been conducted to identify the major risk factors of tobacco use among the youth. This study  
59 was conducted to determine the prevalence of current tobacco use and identify associated factors  
60 among Rwandans aged 15-34 years. The Rwandan government policies cap the age of youth as  
61 persons aged between 14 to 35 years old[11].

62 This study was the first comprehensive analysis of the association of current tobacco use and  
63 selected socio-demographic characteristics for youth aged 15-34 in Rwanda, and provides  
64 evidence for a more targeted programmatic response to tobacco use among the youth in the  
65 country.

## 66 **Materials and Methods**

### 67 **Study design and study population**

68 This was a cross sectional analytical study using secondary data collected from the nationally  
69 representative Non-Communicable Disease Risk Factors Survey, 2013 of Rwanda.

### 70 **Description of the Rwanda Non-Communicable Disease Risk Factors Survey STEPS** 71 **Survey**

72  
73 The STEPS survey was a population based cross-sectional study conducted in all 30 districts  
74 throughout the country from November 2012 to March 2013. The overall objective was to assess  
75 the magnitude of risk factors of selected Non-Communicable Diseases in the Rwandan  
76 population using the WHO STEPwise approach to surveillance (STEPS).

77 A multi-stage cluster sampling design was used to select a nationally representative sample. The  
78 WHO STEPSwise approach was used to collect data using personal digital assistants (PDAs).  
79 These data included socio demographic and behavioural information; physical measurements  
80 such as height, weight, blood pressure and waist and hip circumference. Additionally,  
81 biochemical measurements were collected to assess total cholesterol, triglycerides levels, fasting  
82 blood glucose and urine albumin. In the initial survey, 7200 participants aged 15-64 years were  
83 enrolled.

### 84 **Data Variables**

85 Information on tobacco use was obtained by asking participants if they were current users of  
86 tobacco products. Current smokers were those who had smoked any tobacco product (such as  
87 cigarettes, cigars or rolled tobacco) in the previous 12 months. Additional information was  
88 collected on behavioral as well as physical and biochemical measurements.

## 89 **Statistical analyses**

90 For this secondary study, we extracted data from the STEPS survey for participants aged 15-34  
91 years. Frequencies and percentages were used for descriptive analysis. The primary outcome,  
92 current tobacco use among participants aged 15 to 34 years was modeled as a binary variable.  
93 We carried out weighted analysis to determine the prevalence of tobacco use and conducted  
94 multivariable logistic regression models to identify factors independently associated with current  
95 tobacco use. A p-value  $\leq 0.05$  was considered as significant. We used STATA (StataCorp  
96 11.stata statistical software: Release 12.College Station, Tx:StataCorp LP.) to conduct data  
97 analysis.

## 98 **Ethical consideration**

99  
100 The survey's protocol was reviewed and approved by the Rwanda National Ethics Committee  
101 (RNEC) and the Centers for Disease Control and Prevention (CDC) Institutional Review Board.  
102 Consent was obtained from participants and no individually identifiable information was  
103 collected.

## 104 **Results**

### 105 **Characteristics of participants**

106 A total of 3900 participants aged 15-34 years were included in the analysis, of which 2405 (62%)  
107 were females. Eighty-three percent (3233) had primary education and below, 80% (944) lived in  
108 urban areas, 56% (2187) were married and 80% (3121) were engaged in some form of income  
109 generating employment. The sociodemographic characteristics of study participants by tobacco  
110 use are shown in table 1.

111 **Table 1: Socio-demographic characteristics by tobacco use (N = 3900)**

Variables			Tobacco use		
Age group (in years)	N	Percentage	Yes	No	p value
15-24	1511	38.7	4.4	95.5	0.001***
25-34	2389	61.3	12.4	87.5	
<b>Gender</b>					
Men	1495	38.3	13.9	86	0.001***
Women	2405	61.7	2.4	97.5	
<b>Level of Education</b>					
Primary school and below	3233	82.9	8.7	91.2	0.001***
Secondary and High	669	17.1	4.7	95.2	
<b>Province</b>					
Eastern	972	24.9	8.8	91.1	0.001***
Kigali	560	14.3	7.2	92.8	
Northern	651	16.6	5.4	94.5	
Southern	773	19.8	14	85.9	
Western	944	24.2	4.3	95.6	
<b>Employment status</b>					
No earnings	764	20	2.7	97.2	0.001***
Earnings	3121	80	9.8	90	
<b>Residence</b>					
Rural	2956	20	8	92	0.89 NS
Urban	944	80	7.8	92	
<b>Marital status</b>					
Married	2187	56.1	9.9	90	0.001***
Others	1713	43.9	6.3	93.6	

112

113 **Tobacco use and associated factors**

114 The prevalence (weighted) of current tobacco use (all forms) was 8% (95%CI: 7.08-9.01).

115 Higher prevalence was found among males, young adults aged 24-34, youth whose highest

116 education was primary school or below, those from Southern province (compared to Western),

117 people with income and young married adults (Table 1). There was no statistically significant

118 difference in prevalence of tobacco use among study participants from urban and those from  
 119 rural areas (7.8% vs. 8%).

120  
 121 The factors that were found to be associated with current tobacco use after multivariate analysis  
 122 are shown in table 2. Smoking was associated with being male, aged 25 years and above,  
 123 residing in Eastern, Kigali City and Southern Province and having an income.  
 124 Education attainment was not associated with tobacco use (OR:1.2; 95%CI: [0.8-1.9]).

125 **Table 2: Socio-demographic factors associated with tobacco use among Rwandans aged 15-**  
 126 **34 years, 2012-2013.**

Variables	Univariate analysis			Multivariate analysis		
	Cru de OR	95% CI	P-value	Adjus ted OR	95% CI	P value
<b>Age group (in yeas)</b>						
15-24	1			1		
25-34	3	[2.2-4.2]	0.001***	2.5	[1.7-3.6]	0.001***
<b>Sex</b>						
Women	1			1		
Men	6.5	[5-8.6]	0.001***	6.9	[5.2-9.1]	0.001***
<b>Education</b>						
Secondary school and over	1			1		
Primary school and below	1.9	[1.26- 2.8]	0.002**	1.2	[0.8-1.9]	0.31 NS
<b>Province</b>						
Western	1			1		
Eastern	2.1	[1.4-3.2]	0.001***	2.3	[1.4-3.6]	0.001***
Kigali	1.7	[1-2.9]	0.04*	2.2	[1.2-3.8]	0.006***
Northern	1.2	[0.7-2.1]	0.3NS	1.2	[0.7-2.1]	0.4NS
Southern	3.6	[2.4-5.3]	0.001***	3.4	[2.2-5.1]	0.001***
<b>Residence</b>						
Urban	1					
Rural	1.02	[0.7-1.3]	0.89 NS			
<b>Employment status</b>						
No earning	1			1		
Earning	3.8	[2.4-6,1]	0.001***	2.5	[1.4-4.2]	0.001***
<b>Marital status</b>						

Others	1		
Married	0.6	[0.4-0.7]	0.001***

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127

## 128 Discussion

129 The WHO STEPS survey was conducted in Rwanda with the aim of providing national level  
130 estimates for various NCD risk factors (including tobacco use). To our knowledge, this is the  
131 first study conducted to assess tobacco use and associated factors among youth (15-34 years) in  
132 Rwanda. Our report using the Rwanda WHO STEPs database provides national-level estimates  
133 and information about the prevalence of tobacco use among youth and factors associated with its  
134 use in Rwanda. This secondary analysis targeted the youth which comprises over 60% of the  
135 Rwanda population and also represents the age at highest risk of tobacco initiation [10-12].

136 The findings of the study revealed that prevalence of current tobacco use was 2.4% among  
137 young women, 14% among young men while the overall prevalence among the youth aged 15-35  
138 was 8%. The results revealed quite similar differences in prevalence by gender among the youth  
139 and that of all adults observed during the RDHS 2014/2015 (2% women and 13% men)[14].

140 These findings are consistent with those of global estimates and other surveys which have  
141 found tobacco use to be more prevalent among men than women of all population groups[15].

142 The observation of higher tobacco consumption among males among Rwandan youth has been  
143 consistently observed in many studies conducted in Rwanda and elsewhere. For example,  
144 evidence from the Rwanda National health surveys[15][16][13], Rwanda NCDs risk factors  
145 surveys[6], the psychoactive substance abuse study[17], Ethiopian study on prevalence of  
146 tobacco use and associated factors[18], Southeast Asian Countries study, and the  
147 sociodemographic correlates of tobacco consumption in Rural Gujarat, India[19][20], have all



148 found prevalence of tobacco use to be higher among men compared to women. In this case,  
149 lower consumption of tobacco use among females in our study, may be accentuated by a social  
150 desirability bias.. The culturally tailored stigma associated with tobacco use among females may  
151 also have influenced their response.

152 The lower prevalence of tobacco use among the youth compared to the general population  
153 implies that there is a window of opportunity to intervene before the youth begin smoking.  
154 Implementing coordinated, high-impact interventions, and stricter implementation of tobacco  
155 control measures including mass media campaigns specifically targeting the youth will provide a  
156 chance to prevent initiation of tobacco use.

157 This study identified various socio-demographic factors to be associated with tobacco use. These  
158 included age, gender, income status and province of residence. The association with age, income  
159 and gender has been observed in multiple studies [16-23]. The association with income was  
160 also consistent with findings of the World Health Survey on social determinants of smoking in  
161 low and middle-income countries which have shown that smoking is more prevalent among  
162 people with income s compared to those without. This has been found to be significant after  
163 controlling for age, education and wealth in all settings except women of the low-income country  
164 group[24]. In light of existing evidence, persons with higher incomes have the likelihood to  
165 avoid smoking initiation and use tobacco less[22]. Nevertheless, considering the present study, I  
166 think that income may be a risk factor because tobacco taxation have increased cigarettes prices  
167 on the market. Therefore, people in the poorest wealth quintile may not afford tobacco products.  
168 These findings contrast with the 2015 study conducted in Ethiopia, which found that adults with  
169 low income were more likely to use tobacco as compared to the high income group[18].

170 This study shows that 8% of Rwandan youth are smokers compared 13% of the general  
171 population (15-64 years). This raises concern because young generation will die for tobacco if  
172 they don't quit smoking. This may be attributable to the fact that tobacco industries have end  
173 edge technology to market their products and recruit more users among youth. Another aspects is  
174 that young people may have social networks/wrong companion to initiate them in tobacco  
175 consumption hence they don't have resources and capacity to avoid initiating tobacco and make  
176 necessary steps to quit smoking for those who have already using tobacco. Therefore, behavioral  
177 interventions coupled with cessation programs can help these young people to avoid or quit  
178 smoking.

179 This study revealed variation in tobacco use throughout Rwanda's Provinces. The highest  
180 prevalence was found in Eastern Province This difference could be attributed to the availability  
181 of contraband cigarettes in this region and tobacco farming at a small scale for consumption  
182 purpose.

183 This study had a number of strengths. First, this was the first nationwide study that allowed the  
184 assessing of factors associated with the current tobacco use in Rwandan youth aged 15-34 years.  
185 Secondly, the overall response rate of 99.8% for Step 1, and 98.8% for Steps 2 and 3 in the  
186 primary study was very high and allowed the findings to be generalizable to all Rwandan youth  
187 aged 15-34 years.

188 The limitations of this study were that although it utilized data from the nationally representative  
189 Non-Communicable Disease Risk Factors Surveillance STEPS 2013 of Rwanda, we could not  
190 establish a temporal relationship between the associated factors and tobacco use.

191 In addition, limited variables were collected during the primary data collection and it was not  
192 possible to assess other variables for this study. Furthermore, there is possibility of social

193 desirability bias in reporting tobacco use, especially among women and might have led to  
194 underestimating of prevalence. Considering that the survey was carried out by health care  
195 workers, social desirability might be even higher.

196 The study has some implications: First, considering the health consequences of tobacco use,  
197 having 8% of Rwandan youth as tobacco users represents a substantial risk for morbidity and  
198 mortality unless preventive measures are instituted to mitigate the challenge. Cost effective  
199 interventions like health education should be prioritized to sensitize the youth on the risks  
200 associated with tobacco use. Sustained efforts through price controls and tax measures,  
201 comprehensive ban of tobacco smoking in public places, implementation and enforcement of  
202 bans to selling tobacco to and by minors in schools and families.

203 Second, the higher tobacco use among Rwandan youth implies that tobacco initiation occurs at a  
204 young age group. Implementing targeted interventions in education institutions (primary and  
205 secondary schools, all high learning institutions) should be initiated and strengthened early.

206 Third, there is a need to establish tobacco cessation program in primary care settings. Tobacco  
207 cessation services can be initiated and be made accessible to all who want to quit. Primary health  
208 care workers including nurses at health facilities and home based health care workers and  
209 teachers can be trained on counselling and other components of tobacco cessation services.

210 Fourth, as tobacco use is a behavioral problem and health workers support is proven to be useful,  
211 education of the patients of any non-communicable disease during their contact with health care  
212 provider should be a service of immense importance. Additionally, conventional and folk media  
213 should be used to educate youth at early ages to prevent initiation of tobacco use.

## 214 **Conclusions**

215 The objective of the study was to assess the current smoking prevalence and associated factors  
216 among Rwandan youth aged 15-34 years. This study shows that prevalence of tobacco smoking  
217 is high among Rwandan youth and is estimated to 8%. The study found that the factors  
218 significantly associated with tobacco use among the study population include age, gender,  
219 province of residence and employment status.

220 These findings provide an opportunity for policy makers, decision makers and relevant  
221 stakeholders to develop targeted interventions for young people while implementing tobacco  
222 control policies and planning tobacco control interventions in general. Since Rwandan youth are  
223 at the risk of using tobacco, identifying ways and means of reaching out to these group will be  
224 critical to the success or failure of the tobacco control program.

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285

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291 **Author Contributions**

292 Conceived and developed the protocol: FH. Analyzed the data: SR. Wrote the paper: FH.

293 Provided inputs into conception and development of the protocol: FH. Provided inputs and

294 comments into writing of the manuscript: CM, MAM and SR.