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.

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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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.

4

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	
Gender					
Men	1495	38.3	13.9	86	0.001***
Women	2405	61.7	2.4	97.5	
Level of Education					
Primary school and below	3233	82.9	8.7	91.2	0.001***
Secondary and High	669	17.1	4.7	95.2	
Province					
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	
Employment status					
No earnings	764	20	2.7	97.2	0.001***
Earnings	3121	80	9.8	90	
Residence					
Rural	2956	20	8	92	0.89 NS
Urban	944	80	7.8	92	
Marital status					
Married	2187	56.1	9.9	90	0.001***
Others	1713	43.9	6.3	93.6	

112

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

6

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.**

	Univariate analysis			Multivariate analysis		
Variables **Age group (in yeas)**	**Crude OR**	**95% CI**	**P-value**	**Adjusted OR**	**95% CI**	**P value**
15-24	1			1		
25-34	3	[2.2-4.2]	0.001***	2.5	[1.7-3.6]	0.001***
Sex						
Women	1			1		
Men	6.5	[5-8.6]	0.001***	6.9	[5.2-9.1]	0.001***
Education						
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
Province						
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***
Residence						
Urban	1					
Rural	1.02	[0.7-1.3]	0.89 NS			
Employment status						
No earning	1			1		
Earning	3.8	[2.4-6,1]	0.001***	2.5	[1.4-4.2]	0.001***
Marital status						

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

127

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

8

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].

9

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.

11

Conclusions

214

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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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.