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Patterns and determinants of tobacco use among adolescents aged 13-15 years in 75
low and middle-income countries

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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Abstract

Patterns and determinants of tobacco use among adolescents aged 13-15 years in 75 low and middle-income countries

By Nnaemeka Anosike

Tobacco smoking is the leading cause of death worldwide. Approximately 80% of the world's one billion smokers reside in low and middle income countries. Tobacco use is mostly initiated during adolescence. There is a dearth of surveillance data on tobacco use among adolescents in developing countries. Using data from the global youth tobacco survey (GYTS), which was obtained between 2007 and 2014, the author examined the patterns and determinants of tobacco use among adolescents in low and middle income countries (LMIC). This study included a total of 163,852 adolescents, aged 13-15years, from low and middle income countries in the 6 World Health Organization (WHO) regions, including the African region, the Americas region, the South-East Asia region, the European region, the Eastern Mediterranean region and the Western Pacific region. Multivariate logistic regression was used to analyze the use of the following tobacco products: current cigarette smoking, current smokeless tobacco, any tobacco use, and poly-tobacco use. The prevalence of adolescent cigarette smoking was 9.1%, smokeless tobacco – 5.3%, any tobacco use – 16.2%, and poly-tobacco use – 3.8%. The odds of cigarette smoking in LMIC was significantly lower in the African region (adjusted odds ratio [aOR] = 0.71; 95% confidence interval [CI]: 0.54-0.93) and region of Americas (aOR = 0.48; 95% CI: 0.36-0.63) compared to that of the European region, after adjusting for gender, cigarette brand, country income categorization, survey year, and tobacco excise tax. Examination of findings indicated an increase in the prevalence of cigarette smoking in the African, Eastern Mediterranean, South-East Asia and Western Pacific regions. This highlights the need to improve and strengthen national and regional tobacco regulatory policies.

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1 INTRODUCTION

1.1 Background

1.1.1 Effects of Smoking

Tobacco smoking is the leading cause of death worldwide, accounting for 6 million deaths or 12% of all deaths occurring among adults over the age of 30[1,2]. Smoking is associated with 5% of deaths from communicable diseases and 14% of deaths from non-communicable diseases worldwide[2]. A causal association has been established between tobacco smoking and certain cancers, including leukemia, lung, bladder, and cervical cancers, and cardiovascular diseases, such as abdominal aortic aneurysm, atherosclerosis, cerebrovascular disease, and coronary heart disease[3,4,5,6,7,8]. Tobacco smoking has a causal effect on respiratory diseases, such as chronic obstructive pulmonary disease, pneumonia, poor lung function, asthma, tuberculosis, and wheezing[9,10,11,12,13]. Tobacco smoking also has an adverse effect on reproductive outcomes, including ectopic pregnancy, stillbirths, reduced fertility, low birth weight, premature rupture of membrane, and placental abruption and previa[3,14]. Tobacco smoking is one of the leading contributors of the global burden of diseases, accounting for about 6.9% of the years of life lost and 5.5% of disability adjusted life-years[15,16].

1.1.2 Teenage and Adolescent Smoking

Tobacco use is mostly initiated during adolescence[17,18,19,20]. Approximately 90,000 adolescents worldwide start using tobacco every day[21,22]. Approximately 80-90% of adults who smoke now started by the age of 18 years[23]. Adolescents who smoke have a 16-fold increased risk of smoking and nicotine dependence in adulthood[24]. The initiation of smoking during adolescence is influenced by psychosocial, environmental, and physiological factors[25]. Adolescence represents a transitional period of human development in which individuals are easily influenced by peers and environmental factors. Adolescents engage in smoking due to heightened curiosity and risk-taking behavior, attenuated perception of the health risks of cigarette smoking, as well as pro-tobacco influences from smoking peers, celebrities, parents and guardians, and the appealing marketing and advertising strategies of tobacco companies[17,18,26,24,27]. Studies using animal models have indicated that young organisms are more sensitive to nicotine and to the rewarding effects of nicotine, which could contribute to increased tobacco addiction[21,19,28,20]. The health effects resulting from smoking, including light and intermittent exposure to nicotine, during adolescence persist into adulthood[29,20]. Implementing tobacco prevention and smoking cessation interventions that are targeted toward adolescents and youths is, therefore, critical[22,19].

1.1.3   Smoking and Tobacco Use in Low and Middle-Income Countries

With the declining smoking prevalence in developed countries, tobacco companies are shifting strategies to target developing nations to increase sales. The rise in the youth population of developing countries presents a potential market for tobacco companies to maximize profits[27,30]. Additionally, the youth population is a target for tobacco companies because youth smokers can be seen as substitutes for tobacco users who have quit or died[31,27, 32,33,34]. Approximately 80% of the world's one billion smokers are in low and middle-income countries[35,36]. According to Euromonitor International, the population of smokers in the Middle East and Africa has been estimated to have increased by 7% between 2010 and 2015, and the sales of cigarettes in the Middle East, Africa, and Asia Pacific increased between 2005 and 2014[37,27,38,39,40]. In developing countries, the prevalence of smokers and tobacco users increases by 3.4% per annum[41,42,43]. The increase in smoking prevalence and the sales of cigarettes in developing countries are due to relatively weak tobacco control and prevention policies, predatory tobacco industry marketing, and relatively low awareness of the range of health effects from tobacco use[27,39,41,30]. The increase in tobacco use in low and middle-income countries is a major epidemic because about 80% of all tobacco-related deaths are expected to occur in those countries[41,34].

1.2   Purpose of Study

There is a dearth of surveillance data on tobacco use among at-risk populations, such as youth in low and middle-income countries. An estimated two of three developing countries have limited information on youth tobacco use[41]. While some country-specific data exist on tobacco use prevalence in several countries, no recent study includes a comparison of tobacco use patterns and prevalence among youth in low and middle-income countries. Such comparisons can reveal ecological and geographic trends, which might have implications for regional tobacco control. More so, considering cultural differences in tobacco use, examining the global variation in the prevalence of the use of different tobacco products can highlight unique challenges and opportunities for tobacco control and prevention within countries. To fill these gaps in knowledge, the authors of this study examined the prevalence and determinants of cigarette smoking, smokeless tobacco use, and poly-tobacco use among adolescents aged 13-15 years in 75 low and middle-income countries. We hypothesized that differences in tobacco use behaviors exist across countries by geographical regions and gross national income. The findings of this study provide data on country-specific and international patterns of tobacco use, which has the potential to inform the development of and implementation of tobacco prevention and control policies and programs.

2 METHODOLOGY

2.1   Ethical Consideration and Consent

For the original primary data collection, the national agency responsible for administering the survey provided informed consent to the participants and their parents, and followed institutional review guidelines prior to conducting the surveys[44]. To maintain the anonymity of participants, the data used in the survey are de-identified and publicly available. Institutional Review Board (IRB) approval was, therefore, not sought because the study did not represent human subject research.

2.2   Data Sources

2.2.1   Individual-Level Data: Global Youth Tobacco Survey (GYTS)

All data was obtained from the GYTS, a cross-sectional survey that uses a standardized data sampling method and collection procedures to enable international and intercontinental comparisons. GYTS is a school-based survey of 13 to 15-year-olds sponsored by the World Health Organization (WHO), the Centers for Disease Control and Prevention, the United Nations Children Emergency Fund, the National Cancer Institute, and the Canadian Public Health Association. GYTS data are obtained from a two-stage cluster sampling design. In the first stage, the schools are selected with probability proportional to their enrollment size. In the second stage, the classrooms are selected randomly

within the chosen schools. All the students in the selected classes are eligible to participate in the survey.

Countries were included in this study only if they met the following two criteria: (1) they were low and middle-income countries, as defined using their gross national income in the year preceding the survey using World Bank data; and (2) they had nationally-representative data collected from 2007 through 2014. Countries with data collected in multiple, sub-national sites were excluded to permit direct comparison of country-level data. Countries with the most recent iteration of GYTS conducted before 2007 were excluded to allow for the examination of recent tobacco use behaviors. Analyses were restricted to adolescents aged 13-15 years to allow for an identical target population across all the included countries.

Based on these criteria, 75 low and middle-income countries were included in the study from all 6 WHO regions, representing a total of 163,852 adolescents. The six regions (countries) are: (1) Africa (20 countries: Botswana, Burundi, Cape Verde, Comoros, Congo, Ghana, Guinea, Kenya, Lesotho, Madagascar, Mauritania, Namibia, Niger, Rwanda, Sao Tome and Principe, Senegal, Seychelles, South Africa, Swaziland, and Togo); (2) the Americas (13 countries: Antigua and Barbuda, Belize, Costa Rica, Dominica, El Salvador, Grenada, Guyana, Jamaica, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Suriname); (3) Eastern Mediterranean (10 countries: Djibouti, Egypt, Iran, Jordan, Lebanon, Libya, Morocco, Syria, Tunisia, and Yemen); (4) Europe (14 countries: Albania, Armenia, Azerbaijan, Bulgaria,

Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova,
Montenegro, Romania, and Serbia); (5) South-East Asia (5 countries: Bhutan,
Myanmar, Sri Lanka, Thailand, and Timor-Leste); and (6) Western Pacific (13
countries: Cambodia, Fiji, Kiribati, Malaysia, Marshall Islands, Micronesia,
Mongolia, Papua New Guinea, Philippines, Samoa, Solomon Islands, Tonga, and
Vanuatu).

2.2.2   Ecological (Country-level) Data

Country-level data included gross national income, survey year, and excise tax
as a percentage of cigarette price. Countries' gross national incomes (GNI) in the
year preceding the survey was obtained from the World Bank and used to
categorize all participating countries as low income (GNI < $ 1,025), lower
middle-income (GNI: $1,026 - $4,035), or upper middle-income countries (GNI:
$4,036 - $12,475). The low income countries included in this study are Burundi,
Comoros, Ghana, Guinea, Kenya, Madagascar, Mauritania, Niger, Rwanda,
Senegal, Togo, Yemen, Kyrgyzstan, Myanmar, Cambodia, and Papua New
Guinea. The lower middle-income countries included in this study are Cape
Verde, Congo, Lesotho, Sao Tome and Principe, Swaziland, Belize, El Salvador,
Guyana, Djibouti, Egypt, Iran, Jordan, Morocco, Syria, Armenia, Georgia,
Moldova, Bhutan, Sri Lanka, Thailand, Timor-Leste, Kiribati, Marshall Islands,
Micronesia, Philippines, Samoa, Solomon Islands, Tonga, and Vanuatu. The
upper middle-income countries included in this study are Botswana, Namibia,
Seychelles, South Africa, Antigua, Barbuda, Costa Rica, Dominica, Grenada,

Jamaica, Panama, Saint Kitts, Nevis, Saint Lucia, Saint Vincent, Suriname, Lebanon, Libya, Tunisia, Albania, Azerbaijan, Bulgaria, Kazakhstan, Latvia, Lithuania, Macedonia, Montenegro, Romania, Serbia, Fiji, Malaysia, and Mongolia.

The excise tax on cigarettes within each county was abstracted from the World Health Organization's MPOWER report for 2015. Income categories of the country were based on the GNI of the previous year.

2.3   Survey Definitions/Measures

2.3.1 Current Tobacco Use

Current cigarette smoking is defined as the smoking of cigarettes at least once during the past 30 days. Within the survey, respondents were asked "During the past 30 days (one month), on how many days did you smoke cigarettes?" The response options were as follows: 0 days, 1 or 2 days, 3 to 5 days, 6 to 9 days, 10 to 19 days, 20 to 29 days, and All 30 days. Any response of "1 or 2 days" to "All 30 days" was classified as coming from a current cigarette smoker.

Current cigarette smokers were asked about their brand preferences using the following question "During the past 30 days (one month), what type of cigarettes did you usually smoke?" Cigarette brand preference was categorized into usual brand and no usual brand.

Current Smokeless Tobacco: Current smokeless tobacco was defined as the use of any form of smokeless products during the past 30 days. The smokeless

products include chewing tobacco, snuff, and dip. Within the survey, respondents were asked "During the past 30 days (one month), did you use any form of smokeless tobacco products (e.g. chewing tobacco, snuff, dip)?" Any response of "Yes" was classified as that of a current smokeless tobacco user.

Current other tobacco product (OTP) use: Depending on the prevailing tobacco products used in the included countries, specific tobacco products were assessed in certain countries, including cigars, water pipes, cigarillos, pipes, shisha, and hookahs. People who indicated that they used at least one of these products in the past 30 days were defined as current other tobacco product users.

2.3.2 Any Tobacco Use

Any tobacco use was defined as a report of having used at least one of the following products during the last 30 days: cigarettes, smokeless tobacco, or OTP.

2.3.3 Poly-Tobacco Use

Poly-tobacco users were respondents who indicated that they used more than one tobacco product in the past 30 days (i.e., at least two of the following products during the last 30 days: cigarettes, smokeless tobacco, or OTP).

2.3.4 Socio-Demographic Characteristics

Socio-demographic characteristics including gender (male/female) and age (13-15 years) were assessed.

2.4 Data Analysis

The data analysis for this paper was performed using SAS software, Version 9.4 of the SAS System for Windows. Data estimates obtained from each included country were weighted to account for the probability of being selected, to produce unbiased estimates that are generalizable to the national population, and to adjust for nonresponse.

2.4.1 Unadjusted (Descriptive and Bivariate) Analyses

Descriptive analyses were conducted with the SAS procedure SURVEYFREQ and the WHERE statement to limit the calculation to the desired region. This method was used to assess the overall prevalence and 95% confidence interval (CI) of outcome variables: current cigarette smoking, current smokeless tobacco use, poly-tobacco use, and any tobacco use by sex, country, and income categories. The bivariate analyses between groups were conducted using chi-squared statistic with the significance level set as a two-tailed $p < 0.05$.

2.4.2 Multivariable Analyses

The adjusted association (adjusted odds ratio [aOR]) between each outcome variable (current cigarette smoke, current smokeless tobacco use, poly-tobacco use, and any tobacco use) and predictor characteristics (gender, cigarette brand, geographical region, income categorization, survey year, and excise tax) was assessed using a multivariate logistic regression and the SURVEYLOGISTIC SAS procedure. A significance level of $p < 0.05$ was used to determine significant differences in the prevalence of outcome variables.

2.4.3 Sensitivity Analyses

Adjusted prevalence ratios were obtained through Poisson regression models and the GENMOD SAS procedure. The prevalence ratios from the Poisson models were compared to the aOR from the logistic regression model.

3 RESULTS

3.1   Characteristics of Study Participants

The study included a total of 163,852 participants, aged 13-15 years, with study

populations ranging from 351 in the Marshall Islands to 7,649 in Thailand (Table

1). The composition of study participants according to WHO regions is as follows:

African region – 24.0%, Region of the Americas – 12.4%, Eastern Mediterranean

– 9.5%, European region – 29.0%, South-East Asian region – 10.1%, and

Western Pacific region – 15.0%. The study population was comprised of 51.7%

females. The income categories of countries included in the study include, low

income countries (18.9%), lower middle-income countries (35.6%), and upper

middle-income countries (45.5%). The median overall response rate of the GYTS

survey was 84.3%, with a range from 53.2% (Samoa) to 96% (Botswana).

3.2   Prevalence of Tobacco Use

3.2.1 Prevalence of Current Cigarette Smoke

As shown in Table 2, the median prevalence of current cigarette smokers in the

study population is 9.1%, ranging from 0.2% (in Cambodia) to 43.8% (in Papua

New Guinea). The regional prevalence of current cigarette use in the following

WHO regions are the following: African region – 9.7%, region of the Americas –

9.8%, Eastern Mediterranean region – 5.2%, European region – 11.5%, South-

East Asian region – 8.8%, and Western Pacific region – 10.1% (Table 3). The

prevalence of current cigarette smokers in low income countries is 6.5%, 7.3% in

lower middle-income countries, and 12.8% in upper middle-income countries.

The current cigarette smoking prevalence is 12.5% for male participants and

4.6% for female participants. A total of 85.7% of current cigarette smokers

reported smoking a usual brand of cigarette while 37.4% of current smokers

reported not using a usual brand.

3.2.2 Prevalence of Current Smokeless Tobacco Use

The prevalence of current smokeless tobacco use in the study population is

5.3%. The regional prevalence of current smokeless tobacco are the following:

African region – 10.5%, region of the Americas – 5.0%, Eastern Mediterranean

region – 5.5%, South-East Asian region – 4.8%, and Western Pacific region –

4.5% (Table 3). Among low income countries, the prevalence of current

smokeless tobacco use is 6.4% while it is 5.1% in lower middle-income countries

and 4.7% in upper middle-income countries. The prevalence of current

smokeless tobacco use among male participants is 6.3%, and it is 4.1% among

female participants.

3.2.3 Prevalence of Poly-tobacco Use

A total of 3.8% of the study population were found to be poly-tobacco users,

ranging from 0.1% in Niger to 17.5% in Kiribati (Table 2). The regional

prevalence of poly-tobacco use among the study population is as follows: African region – 3.3%, region of the Americas = 3.9%, Eastern Mediterranean region – 4.3%, European region – 2.6%, South-East Asian region – 5.0%, and Western Pacific region – 3.2% (Table 3). Among low income countries, the prevalence of poly-tobacco use is 2.8% while it is 4.1% in lower middle-income countries and 3.9% in upper middle-income countries. The prevalence of poly-tobacco use is 5.3% among male participants and 2.3% among female participants. Among current cigarette smokers in the study, the prevalence of poly-tobacco use is 33.2%.

3.2.4 Prevalence of Any Tobacco Use

The prevalence of any tobacco use among the study population is 16.2%, ranging from 4.7% in Sri Lanka to 47.6% in Papua New Guinea (Table 2). The regional prevalence of any tobacco use among study participants is the following: African region – 18.3%, region of the Americas – 16.3%, Eastern Mediterranean region – 17.5%, European region – 13.5%, South-East Asian region – 14.5%, and Western Pacific region – 15.1% (Table 3). The prevalence of any tobacco use is 14.0% among low income countries, 15.9% among lower middle-income countries, and 18.6% among upper middle-income countries. The prevalence of any tobacco use among male participants is 21.4% and it is 11.1% among females.

3.3   Factors Associated with Tobacco Use

3.3.1 Current Smoking

After adjusting for sex, cigarette brand, country income categorization, survey year, and tobacco excise tax, the odds of current cigarette smoking were found to be significantly lower in the African region (adjusted odds ratio [aOR] = 0.71; 95% CI: 0.54 – 0.93) and the region of the Americas (aOR = 0.48; 95% CI: 0.36 – 0.63) when compared to the European region (Table 4.1). The odds of current cigarette smoking were significantly higher in upper middle-income countries (aOR = 1.69; 95% CI: 1.23 – 2.32) than in low income countries after adjusting for sex, cigarette brand, geographical region, survey year, and tobacco excise tax.

3.3.2 Current Smokeless Tobacco

After controlling for sex, country income categorization, survey year, and tobacco excise tax, the odds of current smokeless tobacco use were significantly lower in the region of the Americas (aOR = 0.48; 95% CI: 0.35 – 0.64), Eastern Mediterranean region (aOR = 0.47; 95%CI: 0.33 – 0.67), South-East Asian region (aOR = 0.47; 95% CI: 0.28 – 0.79), and the Western Pacific region (aOR = 0.43; 95% CI: 0.30 – 0.62) compared to the African region (Table 4.2).

3.3.3 Poly-tobacco Use Among All Study Participants

After adjusting for sex, country income categorization, survey year, and tobacco excise tax, the odds of poly-tobacco use were significantly higher in the African region (aOR = 1.83; 95% CI: 1.48 – 2.27), region of the Americas (aOR = 1.49; 95% CI: 1.22 – 1.83), Eastern Mediterranean region (aOR = 1.84; 95% CI: 1.40 – 2.41), South-East Asian region (aOR = 2.76; 95% CI: 1.78 – 4.29), and Western Pacific region (aOR = 1.66, 95% CI: 1.30 – 2.12) when compared to the European region (Table 4.3). The odds of poly-tobacco use were significantly higher in lower middle-income countries (aOR = 1.71; 95% CI: 1.26 – 2.32) and upper middle-income countries (aOR = 2.21; 95% CI: 1.67 – 2.91) than low income countries, controlling for sex, geographical region, survey year, and tobacco excise tax.

3.3.4 Poly-tobacco Use Among Current Cigarette Smokers

The odds of poly-tobacco use among current cigarette smokers were significantly higher in the African region (aOR = 1.41; 95% CI: 1.06 – 1.87), the Eastern Mediterranean region (aOR = 3.60; 95% CI: 2.39 – 5.42), and the South-East Asian region (aOR = 1.87; 95% CI: 1.29 – 2.72) compared to the European region after adjusting for sex, cigarette brand, country income categorization, survey year, and tobacco excise tax (Table 4.4).

3.3.5 Any Tobacco Use

After adjusting for sex, country income categorization, survey year, and tobacco excise tax, the odds of any tobacco use were significantly higher in the African region (aOR = 2.01; 95% CI: 1.74 – 2.33), the region of the Americas (aOR = 1.25; 95% CI: 1.10 – 1.42), the Eastern Mediterranean region (aOR = 1.48; 95% CI: 1.27 – 1.73), the South-East Asian region (aOR = 1.70; 95% CI: 1.35 – 2.15), and the Western Pacific region (aOR = 1.65; 95% CI: 1.39 – 1.97) in comparison to the European region (Table 4.5). After adjusting for sex, geographical region, survey year, and tobacco excise tax, the odds of any tobacco use were significantly higher in lower middle-income countries (aOR = 1.65; 95% CI: 1.35 – 2.00) and upper middle-income countries (aOR = 2.19; 95% CI: 1.83 – 2.62) than in low income countries.

3.4   Sensitivity Analysis

The odds ratios and prevalence measures obtained were mostly in the same direction around the null but different in magnitude (Tables 4.1 – 4.5). The prevalence ratios were more conservative than the odds ratio, but the odds ratios were more likely to overestimate the effect than prevalence ratios. The adjusted odds ratio of current cigarette smokers with a usual brand of cigarettes is 8.60 (95% CI: 6.97 – 10.63). The adjusted prevalence ratio of current cigarette smokers with a usual brand of cigarettes is 2.11 (95% CI: 1.88 – 2.37). The aOR of cigarette smoking among females compared to males is 0.56 (95% CI: 0.47 –

0.67) while the adjusted prevalence ratio of smoking among females compared to males is 0.87 (95% CI: 0.83 – 0.91).

4 DISCUSSION

4.1   Discussion

Tobacco is a principal contributor of chronic diseases and mortality globally[1,2]. The findings of this study, using the GYTS data obtained from low and middle-income countries from 2007 to 2014, showed differences in the prevalence of tobacco use by gender, region, and income. This study indicated the following: a lower prevalence of current cigarette smoking in the regions of Africa and Americas than in the European region, a higher prevalence of cigarette smoking among male participants than in female participants, and an increased prevalence of current cigarette smoking in upper middle-income countries than in low income countries.

A comparison of the findings of this study with the data obtained from the GYTS survey administered between 1999 and 2005 indicates an increase in the prevalence of cigarette smoking in the African, Eastern Mediterranean, South-East Asian, and Western Pacific regions but a decrease in the prevalence of cigarette smoking in the Americas and the European region[45]. The same comparison indicated an increase in the prevalence of cigarette smoking among girls in the African, South-East Asian, and Western Pacific regions[45]. The increase in smoking prevalence in some of the regions could be due to the aggressive marketing strategies of transnational tobacco companies, increased indigenous production of tobacco, weak tobacco regulations, ineffective tobacco control policies, and a lack of public awareness about the health risks associated

with tobacco use[30,27,39,41,46,47]. The increase in uptake of smoking among females could be associated with the early initiation of smoking among girls at young ages and the execution of various advertising strategies that are targeted toward girls and women[47]. Also, the increase in cigarette smoking among girls could be attributed to gender empowerment. Some studies indicate that countries with high female empowerment measures have higher rates of smoking among women than men[48,49]. Gender empowerment measures include economic participation and decision-making, political participation and decision-making, and power over economic resources[48]. Although the prevalence of cigarettes is increasing among girls in some regions, smoking is still very common among boys in all regions[47].

One of the results of this study is a higher prevalence of current smokeless tobacco use in Africa compared to other regions. In this study, there was a narrowed gender difference in the prevalence of smokeless tobacco compared to that of cigarette smoking[40,45]. Smokeless tobacco increases the risk of developing chronic diseases, including periodontal diseases and oral cancer[40,47,50]. Although some companies suggest that smokeless tobacco products could help with smoking cessation, studies have found limited efficacy for the smoking cessation effects of smokeless tobacco[51,52,53,54,55]. Previous studies indicate that, while the use of smokeless tobacco is associated with the concurrent use of cigarettes, it precedes the initiation of cigarette smoking[50,56,57]. This association could be due to familial and cultural acceptance and the ease of access to smokeless tobacco products that are sometimes cheaper than

manufactured cigarettes[47,50]. The high prevalence of current smokeless tobacco

in the African region indicates a potential increase in the prevalence of cigarette

smoking and the burden of diseases associated with smokeless tobacco. The

wide use of smokeless tobacco shows that tobacco smoking regulations should

include strategies that target the cessation of smokeless tobacco[50,58].

The findings of this study indicate a higher prevalence of poly-tobacco products

in all WHO regions compared to the European region and higher odds of poly-

tobacco use in upper middle and low middle-income countries compared to low

income countries. Poly-tobacco refers to the concurrent use of at least two

tobacco products[59]. Policies to curb cigarette smoking and tobacco use could

have led to the increasing prevalence of poly-tobacco use[60]. Although increases

in tobacco excise taxes are associated with reductions in tobacco use and

increased smoking cessation, it can also contribute to the increase in use of

other tobacco products and poly-tobacco[61,62,63,60]. Following tax hikes on

tobacco products, there might be a resulting behavioral response to seeking and

using cheap, alternative forms of tobacco products[62,60]. This is pertinent to

adolescents and individuals of lower income because they might to switch to

cheaper, low-taxed, or self-made tobacco products[64]. Policies banning smoking

indoors or in public spaces are mostly concerned with cigarette smoking.

Therefore, individuals might utilize other forms of tobacco in public places to

evade smoke-free policies[60,64]. Among the current cigarette smokers in this

study, the prevalence of poly-tobacco use is similar for girls and boys.

Considering the health consequences of the use of tobacco products, the

pervasive use of poly-tobacco could present substantial burden of disease in the future. In addition to policies targeting manufactured cigarette smoking, controlling other locally available tobacco products should be instituted to enhance tobacco regulation and improve cessation rate[60,64].

Another contributory factor to tobacco use could be the inaccurate perception of the health hazards of tobacco. The perception of risk associated with tobacco products has an impact on the utilization of tobacco products[65]. A study conducted in the United States shows that a substantial percentage of the population held inaccurate views about the relative health risks of tobacco products[66]. This suggests that public health education is needed to provide accurate information about the risks of the use of various tobacco products for adults and youth[66,67]. The risk information about tobacco products can be communicated to consumers through tobacco packaging elements because the packaging elements can serve as information dissemination channels[68]. Previous studies have indicated that the placement of graphic health labels contributes to decreases in smoking prevalence[69,70,71].

The placement of health warnings and plain packaging on tobacco packets is one of the measures recommended by the World Health Organization Framework Convention on Tobacco Control (WHO FCTC), as indicated by article 11 of the WHO FCTC[72]. The WHO FCTC is an international public health treaty. It is currently adopted by 180 countries and was created to address the global tobacco epidemic[72,73]. The regulations proposed by the WHO FCTC include higher tobacco prices and tax increases, smoke-free policies in indoor

workplaces and public venues, the placement of health risk messages on

tobacco packages, and limited advertising of tobacco products[74,72]. Article 11 of

the WHO FCTC proposes approved health warnings on tobacco packages that

should be rotating, large, and clear. They should cover more than 50% of the

principal display area and may be presented in a pictogram form[72]. The

implementation of the labeling and packaging policies for tobacco products has

seen varying regional progress. All the included countries in Eastern

Mediterranean and European regions reported introducing health warnings on

tobacco packages[75]. Approximately 80% of countries in the Americas region,

80% of countries in the South-East Asia region, 80% of countries in the Western

Pacific region and 75% countries in African region reported introducing health

warnings on tobacco packages[75]. Sixty percent of the countries in the Americas

region, 30% of countries in the African region, 30% of countries in the Eastern

Mediterranean region, 30% of countries in the Western Pacific region, 20% of

countries in the European region and 20% of countries in the South-East region

reported having health warnings that cover more than 50% of the display on

tobacco packages[75]. Overall, only about 9% of countries within the WHO report

the implementation of warning labels that cover at least 50% of packet display

area[76]. This highlights the need for countries to improve their domestic tobacco

regulation policies by increased implementation of the WHO FCTC guidelines[76].

4.2   Limitations

This study has several limitations. First, the study included adolescents aged 13-15 years who attend school and were present on the day of data collection[45,74]. The survey could have missed those who do not go to school, those who have dropped out, or those who were absent and were unable to participate in the survey, limiting the generalizability of the study findings to other adolescents and youths[45,74,1]. In addition, 54 out of 69 countries reported a response rate of $\geq$ 80%. The high response rate in the GYTS data could have helped to reduce the likelihood of bias due to nonresponse and absence[74,1,77]]. Second, the data is based on self-reports, which could lead to the misreporting of certain behaviors and may not produce the true prevalence of tobacco use[45,74,77]. However, self-reported measures of cigarette smoking and use of smokeless tobacco have been validated in studies using biochemical tests that assessed serum and urinary cotinine levels[77,78,79,60,80,81]. Third, only low and middle-income countries with GYTS data obtained after 2007 were included in this study. Therefore, regional findings may not be reflective of tobacco use in each of the WHO regions[1,60]. Some countries were not included because they did not have GYTS data collected after 2007. This indicates a need for the enhancement of tobacco surveillance to provide recent estimates that will help guide and evaluate national tobacco regulatory policies[77].

5 CONCLUSION

In this study, using GYTS data obtained between 2007 and 2014, the odds of current cigarette smoking were lower in the African region and the region of the Americas compared to the European region. The odds of current smokeless tobacco use were higher in the African region compared to all the other regions. A comparison of the findings of this study to those of the GYTS data obtained between 1999 and 2005 indicated an increase in the prevalence of current cigarette smoking in the African, Eastern Mediterranean, South-East Asian, and Western Pacific regions[45]. The increasing prevalence of tobacco smoking among adolescents in certain geographical regions highlights the need for the greater implementation of the WHO FCTC measures drafted to regulate and limit exposure to tobacco. Also, the pervasive use of at least one type of tobacco product or any tobacco use among adolescents in this study indicates the need for tobacco control policies to target smokeless and locally made tobacco products.

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Table 1. Characteristics of adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey (GYTS), 2007 – 2014[a]

Region/Country	Income category[b]	Survey Year	Total sample size, n	Female participants (%)	Overall Response Rate (%)
African Region					
Botswana	Upper Middle Income	2008	1611	58.4	96.0
Burundi	Low Income	2008	1110	57.3	68.6
Cape Verde	Lower Middle Income	2007	1188	56.7	89.9
Comoros	Low Income	2007	811	57.0	80.8
Congo (Republic)	Lower Middle Income	2009	1141	48.9	69.7
Ghana	Low Income	2009	4171	50.6	84.0
Guinea	Low Income	2008	1305	48.3	65.8
Kenya	Low Income	2007	6768	55.4	89.4
Lesotho	Lower Middle Income	2008	1604	62.5	83.2
Madagascar	Low Income	2008	1184	54.8	83.3
Mauritania	Low Income	2009	1769	51.6	91.1
Namibia	Upper Middle Income	2008	1397	56.9	89.1
Niger	Low Income	2009	1307	51.8	95.9
Rwanda	Low Income	2008	688	52.8	91.8
Sao Tome and Principe	Lower Middle Income	2010	3638	55.0	-

Senegal	Low Income	2007	1611	52.8	82.1
Seychelles	Upper Middle Income	2007	844	50.9	86.0
South Africa	Upper Middle Income	2011	3947	57.7	69.1
Swaziland	Lower Middle Income	2009	1239	59.8	97.0
Togo	Low Income	2007	1947	40.4	89.9
Region of the Americas					
Antigua and Barbuda	Upper Middle Income	2009	1068	54.1	85.8
Belize	Lower Middle Income	2008	1138	53.0	93.9
Costa Rica	Upper Middle Income	2008	2920	50.3	80.6
Dominica	Upper Middle Income	2009	934	52.4	80.1
El Salvador	Lower Middle Income	2009	3063	52.0	93.8
Grenada	Upper Middle Income	2009	1798	51.6	87.9
Guyana	Lower Middle Income	2010	1751	53.8	x
Jamaica	Upper Middle Income	2010	1188	51.1	x

Panama	Upper Middle Income	2008	2716	52.9	80.0
Saint Kitts and Nevis	Upper Middle Income	2010	770	52.1	73.9
Saint Lucia	Upper Middle Income	2011	858	52.6	75.1
Saint Vincent and the Grenadines	Upper Middle Income	2011	1102	48.1	80.9
Suriname	Upper Middle Income	2009	927	57.0	93.4
Eastern Mediterranean Region					
Djibouti	Lower Middle Income	2009	1096	44.8	90.1
Egypt	Lower Middle Income	2009	3472	50.4	97.1
Iran	Lower Middle Income	2007	1153	47.9	85.9
Jordan	Lower Middle Income	2009	1523	58.9	90.3
Lebanon	Upper Middle Income	2011	1651	54.0	87.4
Libya	Upper Middle Income	2010	1361	51.4	97.9
Morocco	Lower Middle Income	2010	2106	47.0	91.8

Syria	Lower Middle Income	2010	1210	50.5	72.9
Tunisia	Upper Middle Income	2010	1294	52.5	94.6
Yemen	Low Income	2008	650	37.5	83.5
European Region					
Albania	Upper Middle Income	2009	3751	53.5	86.9
Armenia	Lower Middle Income	2009	2610	54.6	78.0
Azerbaijan	Upper Middle Income	2011	2018	50.0	73.2
Bulgaria	Upper Middle Income	2008	3241	48.3	87.3
Georgia	Lower Middle Income	2008	891	52.8	81.7
Kazakhstan	Upper Middle Income	2009	10185	52.2	79.6
Kyrgyzstan	Low Income	2008	3004	52.6	93.2
Latvia	Upper Middle Income	2011	3130	48.5	82.2
Lithuania	Upper Middle Income	2009	1237	50.9	65.4
Macedonia	Upper Middle Income	2008	4388	49.1	90.1

Moldova	Lower Middle Income	2008	3501	55.6	84.3
Montenegro	Upper Middle Income	2008	3299	51.9	92.9
Romania	Upper Middle Income	2009	2982	52.0	94.1
Serbia	Upper Middle Income	2008	3350	54.6	89.4
South-East Asian Region					
Bhutan	Lower Middle Income	2013	1378	54.6	x
Myanmar	Low Income	2011	1652	49.3	93.4
Sri Lanka	Lower Middle Income	2011	4031	52.6	84.2
Thailand	Lower Middle Income	2009	7649	51.3	93.1
Timor-Leste	Lower Middle Income	2013	1908	49.0	x
Western Pacific Region					
Cambodia	Low Income	2010	1637	57.0	92.7
Fiji	Upper Middle Income	2009	1428	59.7	82.5
Kiribati	Lower Middle Income	2009	988	55.4	82.9

Malaysia	Upper Middle Income	2009	3021	49.5	91.3
Marshall Islands	Lower Middle Income	2009	351	56.8	58.8
Micronesia	Lower Middle Income	2007	1363	52.1	84.0
Mongolia	Upper Middle Income	2014	6178	51.1	x
Papua New Guinea	Low Income	2007	1368	51.9	82.1
Philippines	Lower Middle Income	2011	3708	53.7	84.1
Samoa	Lower Middle Income	2007	900	56.6	53.2
Solomon Islands	Lower Middle Income	2008	693	59.3	55.4
Tonga	Lower Middle Income	2010	1628	59.3	80.5
Vanuatu	Lower Middle Income	2007	1355	57.2	71.7

[a]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study

[b]Country income classification evaluated using the country's gross national income provided by the World Bank

[x]Data not available

Table 2. Prevalence of cigarette smoking, smokeless tobacco, poly-tobacco and any tobacco use among adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[a] by country

Region/Country	Prevalence of Current Cigarette Smoking			Prevalence of Current Smokeless Tobacco Use			Prevalence of Poly-tobacco Use		Prevalence of Any Tobacco Use		
	Overall % (95% CI[b])	Boys % (95% CI)	Girls % (95% CI)	Overall % (95% CI)	Boys % (95% CI)	Girls % (95% CI)	Overall % (95% CI)	Among Cigarette Smokers % (95% CI)	Overall % (95% CI)	Boys % (95% CI)	Girls % (95% CI)
African Region											
Botswana	14.3 (10.9-17.7)	18.1 (12.9-23.3)	10.9 (7.3-14.4)	11.3 (9.3-13.4)	11.3 (7.6-15.1)	11.4 (9.0-13.8)	7.6 (5.7-9.5)	40.8 (34.7-46.9)	23.6 (20.0-27.2)	27.0 (21.3-32.6)	20.5 (16.8-24.2)
Burundi	4.6 (2.1-7.1)	5.8 (1.6-10.0)	3.2 (0.9-5.5)	x			0.7 (0.004-1.3)	16.7 (10.3-23.2)	19.1 (12.1-26.0)	20.3 (11.8-28.8)	16.8 (9.3-24.2)
Cape Verde	3.5 (2.4-4.6)	3.7 (1.8-5.6)	3.1 (1.4-4.8)	x			0.5 (0.1-0.8)	13.7 (3.2-24.1)	13.4 (11.8-15.0)	14.7 (12.1-17.3)	11.7 (9.3-14.1)
Comoros	9.6 (6.3-12.8)	13.5 (7.1-19.9)	6.9 (2.6-11.2)	x			2.2 (0.8-3.7)	24.9 (18.6-31.2)	18.1 (14.1-22.1)	21.7 (14.1-29.3)	14.8 (9.9-19.8)
Congo	8.2 (6.1-10.3)	11.3 (7.8-14.8)	5.0 (2.6-7.4)	15.1 (12.1-18.1)	16.7 (12.5-20.9)	13.3 (8.5-18.0)	6.7 (4.2-9.3)	37.0 (15.6-58.3)	23.1 (19.2-27.0)	26.2 (21.2-31.2)	19.6 (13.9-25.2)
Ghana	3.6 (2.0-5.3)	4.3 (2.4-6.3)	2.9 (1.3-4.5)	x			1.5 (0.7-2.2)	43.2 (28.9-57.5)	12.5 (9.5-15.5)	14.0 (10.5-17.5)	10.5 (7.5-13.6)
Guinea	7.1 (4.4-9.9)	11.6 (7.2-16.0)	1.6 (0.3-3.0)	17.2 (8.0-26.4)	17.9 (7.5-28.2)	16.0 (6.9-25.0)	6.0 (4.1-7.9)	28.1 (19.1-37.1)	25.7 (16.9-34.5)	30.7 (21.1-40.3)	19.6 (10.8-28.4)

Kenya	8.2 (5.7-10.7)	11.2 (8.8-13.7)	5.2 (3.2-7.2)	x			2.6 (1.7-3.6)	34.3 (28.8-39.9)	15.0 (10.8-19.2)	14.8 (12.8-16.7)	14.4 (6.3-22.6)
Lesotho	10.1 (6.4-13.8)	11.8 (5.8-17.9)	7.5 (4.4-10.6)	14.4 (10.9-18.0)	14.7 (9.1-20.3)	13.6 (9.5-17.7)	8.4 (6.5-10.3)	41.1 (30.3-51.9)	24.7 (19.4-30.0)	26.4 (19.2-33.6)	21.7 (16.8-26.6)
Madagascar	19.3 (14.5-24.1)	30.7 (22.3-39.1)	10.2 (4.7-15.6)	5.7 (0.4-11.1)	6.2 (0.8-11.5)	5.4 (0.0-11.8)	3.3 (1.5-5.2)	17.2 (8.9-25.5)	22.7 (15.5-29.9)	33.1 (23.1-43.1)	14.3 (6.8-21.7)
Mauritania	11.6 (8.6-14.5)	14.6 (10.7-18.4)	9.0 (5.9-12.0)	x			0.8 (0.3-1.3)	8.0 (2.9-13.1)	22.2 (18.1-26.3)	27.0 (22.5-31.5)	17.5 (13.0-22.1)
Namibia	11.9 (8.7-15.2)	12.3 (7.3-17.4)	11.3 (7.8-14.8)	16.0 (12.8-19.2)	15.6 (11.6-19.5)	15.8 (12.1-19.4)	10.1 (7.2-13.0)	50.6 (40.3-60.8)	30.9 (26.8-35.0)	31.8 (25.5-38.1)	29.8 (25.4-34.2)
Niger	3.5 (2.5-4.6)	6.8 (4.7-8.9)	0.6 (0.0-1.4)	x			0.1 (0.0-0.3)	4.1 (0.0-11.2)	8.6 (6.8-10.3)	11.8 (10.4-13.3)	5.6 (3.1-8.1)
Rwanda	1.8 (0.7-3.0)	3.0 (1.3-4.6)	0.9 (0.0-2.0)	7.4 (4.6-10.2)	8.3 (3.6-13.0)	6.0 (3.1-8.9)	4.5 (2.1-6.9)	41.1 (0.0-100.0)	11.5 (8.4-14.6)	13.3 (7.5-19.0)	9.4 (6.0-12.9)
Sao Tome and Principe	4.4	6.1	3.0	22.8	26.9	19.6	15.0	76.0	26.1	30.6	22.7
Senegal	7.5 (3.8-11.1)	12.1 (6.6-17.7)	2.7 (0.7-4.7)	x			1.5 (0.8-2.2)	21.2 (14.9-27.5)	14.9 (9.0-20.8)	20.4 (13.9-27.0)	9.6 (2.5-16.6)
Seychelles	21.5 (16.2-26.8)	23.2 (16.6-29.7)	20.0 (14.3-25.7)	5.5 (2.9-8.1)	5.2 (2.0-8.3)	5.4 (2.7-8.0)	4.9 (3.1-6.8)	18.4 (11.9-24.9)	26.6 (21.3-31.9)	27.1 (19.9-34.3)	25.3 (19.9-30.6)
South Africa	12.7 (10.8-14.5)	15.0 (12.4-17.5)	10.8 (8.7-13.0)	x			3.8 (3.0-4.7)	32.3 (27.5-37.2)	21.4 (19.2-23.6)	24.2 (21.3-27.2)	19.0 (16.6-21.4)

Swaziland	6.4 (3.8-8.9)	9.2 (4.8-13.5)	4.5 (2.6-6.4)	5.4 (3.1-7.8)	6.0 (2.7-9.4)	5.0 (3.1-6.9)	3.0 (1.8-4.2)	26.3 (20.5-32.2)	11.5 (8.3-14.7)	15.8 (11.1-20.5)	8.6 (5.7-11.5)
Togo	6.2 (3.0-9.3)	9.1 (4.0-14.2)	1.7 (0.9-2.4)	6.2 (4.8-7.6)	6.9 (4.6-9.2)	4.8 (3.0-6.6)	4.0 (2.3-5.6)	40.4 (24.9-55.9)	13.9 (10.9-16.9)	17.7 (12.8-22.5)	7.9 (5.1-10.6)
Region of the Americas											
Antigua and Barbuda	5.2 (3.7-6.7)	5.2 (3.3-7.0)	4.3 (2.1-6.5)	6.8 (5.2-8.4)	8.4 (6.4-10.4)	5.8 (3.4-8.1)	5.1 (4.0-6.2)	50.0 (36.9-63)	20.1 (17.5-22.6)	24.3 (21.0-27.7)	15.9 (12.1-19.8)
Belize	7.7 (5.4-10.1)	11.7 (7.8-15.6)	4.4 (2.0-6.8)	5.7 (3.4-8.0)	5.8 (2.8-8.7)	5.5 (3.2-7.8)	4.0 (2.5-5.5)	32.1 (19.8-44.4)	18.3 (15.4-21.3)	21.8 (18.0-25.7)	15.3 (11.8-18.7)
Costa Rica	9.6 (7.7-11.5)	9.4 (7.0-11.7)	9.7 (7.5-11.9)	x			2.4 (1.6-3.1)	25.3 (18.4-32.2)	14.6 (13.0-16.2)	15.8 (13.9-17.8)	13.1 (11.1-15.2)
Dominica	11.6 (8.6-14.7)	13.8 (8.7-18.9)	8.9 (5.5-12.2)	8.4 (6.7-10.1)	10.2 (7.2-13.2)	6.4 (4.1-8.7)	5.8 (4.1-7.5)	29.4 (20.1-38.7)	25.3 (21.8-28.7)	30.3 (24.3-36.4)	19.8 (15.8-23.9)
El Salvador	9.1 (7.1-11.1)	11.2 (7.8-14.6)	7.1 (5.4-8.7)	3.7 (2.8-4.6)	4.5 (3.0-6.0)	2.8 (2.1-3.5)	3.7 (2.7-4.6)	29.7 (23.4-36.0)	14.5 (12.5-16.6)	18.1 (14.8-21.5)	11.0 (9.0-13.0)
Grenada	8.1 (6.2-10.0)	9.9 (7.2-12.6)	6.2 (4.1-8.3)	8.4 (6.8-10.0)	10.1 (7.4-12.8)	6.9 (5.3-8.5)	1.5 (0.9-2.2)	20.0 (13.0-27.1)	14.4 (12.0-16.9)	17.2 (13.5-20.9)	11.7 (9.3-14.1)
Guyana	9.5 (6.7-12.3)	13.3 (8.5-18.1)	5.6 (4.3-6.9)	7.5 (5.5-9.5)	7.9 (4.6-11.1)	6.6 (4.3-8.9)	5.5 (3.4-7.5)	31.1 (21.7-40.5)	20.9 (17.2-24.6)	25.3 (20.0-30.6)	16.0 (12.7-19.3)
Jamaica	17.8 (12.1-23.4)	21.5 (15.2-27.8)	14.3 (7.7-20.9)	8.5 (5.7-11.3)	8.5 (3.9-13.1)	8.5 (5.3-11.7)	8.3 (5.8-10.9)	35.5 (28.9-42.1)	28.7 (22.5-34.9)	31.3 (23.7-38.9)	24.6 (16.0-33.3)
Panama	4.3 (2.8-5.9)	5.9 (3.7-8.1)	2.8 (1.4-4.2)	3.5 (2.5-4.6)	3.8 (2.1-5.4)	3.2 (2.1-4.3)	2.0 (1.3-2.6)	29.6 (22.7-36.5)	8.3 (6.1-10.6)	10.3 (7.2-13.5)	6.4 (4.5-8.3)

Saint Kitts and Nevis	4.0 (2.0-6.0)	4.8 (2.0-7.6)	3.2 (0.9-5.5)	x			0.6 (0.1-1.1)	16.9 (5.0-28.7)	9.1 (6.1-12.1)	10.4 (6.4-14.4)	7.7 (4.2-11.2)
Saint Lucia	10.7 (7.5-13.9)	13.3 (8.3-18.3)	8.5 (5.0-12.1)	6.2 (4.6-7.7)	8.3 (5.9-10.9)	4.1 (2.5-5.8)	5.0 (3.5-6.5)	28.0 (17.9-38.0)	20.7 (17.4-24.0)	24.4 (19.2-29.6)	17.3 (13.0-21.6)
Saint Vincent and the Grenadines	12.8 (9.8-15.9)	16.6 (12.4-20.8)	8.5 (5.6-11.4)	6.3 (4.8-7.9)	7.1 (4.5-9.6)	5.5 (3.8-7.2)	4.9 (3.1-6.6)	24.0 (14.0-34.0)	19.4 (15.9-22.8)	23.6 (18.8-28.4)	14.5 (11.3-17.7)
Suriname	12.1 (9.0-15.2)	14.0 (10.5-17.5)	10.1 (5.0-15.2)	5.1 (3.5-6.7)	6.2 (3.4-9.0)	4.3 (1.9-6.6)	3.7 (2.5-4.8)	21.1 (14.0-28.2)	19.2 (16.1-22.2)	20.7 (16.8-24.5)	16.6 (12.0-21.3)
Eastern Mediterranean Region											
Djibouti	7.0 (4.4-9.5)	9.5 (5.3-13.8)	3.5 (1.7-5.3)	12.6 (9.3-15.8)	15.2 (11.6-18.9)	9.0 (4.5-13.5)	6.3 (3.9-8.6)	57.0 (44.8-69.2)	19.0 (14.9-23.1)	22.7 (17.4-28.0)	14.3 (9.7-18.8)
Egypt	8.9 (4.1-13.7)	15.5 (10.8-20.1)	2.8 (1.0-4.6)	x			4.0 (2.2-5.8)	46.9 (33.1-60.6)	12.0 (7.4-16.7)	19.9 (15.7-24.1)	3.8 (2.0-5.6)
Iran	3.0 (1.7-4.4)	5.1 (3.4-6.8)	0.9 (0.4-1.3)	5.1 (3.4-6.8)	5.4 (4.1-6.6)	4.8 (2.8-6.8)	4.1 (2.0-6.2)	52.7 (26.8-78.7)	20.8 (15.5-26.0)	25.8 (21.4-30.3)	15.0 (10.4-19.7)
Jordan	11.5 (8.0-15.1)	17.4 (14.5-20.3)	6.6 (5.1-8.1)	x			6.5 (4.3-8.7)	60.3 (53.2-67.4)	24.8 (19.5-30.1)	33.2 (29.2-37.1)	18.3 (14.3-22.3)
Lebanon	11.3 (8.9-13.7)	17.7 (14.1-21.4)	6.0 (3.8-8.2)	x			9.3 (7.5-11.1)	85.4 (79.5-91.4)	36.2 (30.6-41.9)	41.9 (36.6-47.2)	31.4 (23.5-39.3)
Libya	4.3 (2.7-5.8)	6.1 (4.0-8.3)	2.0 (0.8-3.2)	2.3 (1.2-3.3)	2.0 (0.7-3.3)	2.3 (1.0-3.6)	2.0 (1.1-3.0)	43.4 (32.2-54.6)	8.1 (6.0-10.2)	11.0 (8.3-13.6)	5.0 (2.8-7.2)
Morocco	2.8 (0.7-4.8)	2.8 (1.1-4.4)	2.3 (0.0-4.9)	6.6 (3.7-9.6)	7.6 (5.0-10.3)	5.1 (1.2-9.0)	3.3 (0.7-6.0)	82.8 (68.6-100.0)	9.5 (6.5-12.4)	11.3 (8.3-14.3)	6.6 (2.9-10.3)

Syria	6.8 (4.2-9.4)	10.7 (6.6-14.9)	3.1 (1.5-4.6)	5.9 (3.4-8.3)	7.6 (3.6-11.6)	3.6 (2.7-4.5)	6.0 (4.2-7.8)	77.3 (62.3-92.3)	24.5 (19.8-29.2)	31.6 (26.4-36.8)	17.4 (14.9-20.0)
Tunisia	6.6 (4.8-8.3)	12.4 (8.9-15.8)	1.6 (0.6-2.7)	2.3 (1.2-3.4)	3.9 (2.0-5.8)	0.9 (0.3-1.4)	2.4 (1.1-3.7)	28.5 (17.7-39.3)	11.4 (8.7-14.2)	20.1 (15.6-24.5)	3.8 (1.9-5.7)
Yemen	3.9 (2.1-5.8)	4.2 (2.2-6.2)	1.6 (0.5-2.7)	8.6 (5.2-11.9)	8.2 (4.8-11.6)	8.4 (1.6-15.2)	4.6 (1.8-7.4)	42.7 (16.6-68.7)	13.8 (8.8-18.9)	13.9 (8.6-19.3)	10.9 (4.9-16.9)
European Region											
Albania	11.5 (9.5-13.5)	17.6 (14.2-21.0)	6.3 (5.0-7.7)	x			1.7 (1.1-2.3)	16.3 (11.7-20.8)	11.8 (10.0-13.5)	17.6 (14.7-20.5)	6.7 (5.3-8.0)
Armenia	3.3 (2.2-4.4)	6.1 (4.1-8.1)	1.0 (0.3-1.6)	x			1.7 (1.1-2.3)	52.8 (45.3-60.2)	7.3 (5.8-8.8)	10.9 (8.4-13.5)	4.3 (2.8-5.7)
Azerbaijan	2.7 (1.1-4.3)	4.5 (1.6-7.4)	0.9 (0.1-1.8)	x			1.8 (0.3-3.4)	70.0 (42.9-97.2)	6.8 (4.8-8.7)	11.4 (7.9-14.9)	2.1 (0.8-3.5)
Bulgaria	28.2 (23.9-32.6)	24.4 (19.9-29.0)	31.6 (25.6-37.6)	x			5.8 (4.5-7.0)	21.9 (18.7-25.1)	29.3 (25.1-33.5)	26.4 (21.6-31.2)	31.8 (26.3-37.3)
Georgia	8.6 (4.8-12.3)	15.2 (8.8-21.6)	2.8 (0.0-5.8)	x					8.1 (4.7-11.6)	14.3 (8.4-20.2)	2.7 (0.0-5.5)
Kazakhstan	7.9 (6.4-9.3)	10.2 (8.0-12.3)	5.8 (4.5-7.0)	x			3.3 (2.5-4.0)	43.9 (38.7-49.0)	10.1 (8.3-11.9)	12.7 (10.2-15.3)	7.7 (6.2-9.3)
Kyrgyzstan	4.4 (3.2-5.6)	6.8 (4.7-9.0)	2.2 (1.1-3.3)	x			2.4 (1.5-3.3)	58.2 (47.6-68.8)	7.2 (5.1-9.2)	10.3 (7.5-13.2)	4.4 (2.5-6.2)
Latvia	31.5 (27.5-35.5)	29.2 (23.7-34.8)	33.8 (29.5-38.1)	x			9.1 (7.6-10.6)	30.7 (27.5-34.0)	33.3 (30.0-36.7)	31.6 (26.9-36.3)	34.9 (30.8-39.0)

Lithuania	30.8 (25.9-35.7)	34.4 (27.5-41.2)	27.1 (22.0-32.1)	x			4.9 (3.5-6.3)	17.2 (13.1-21.4)	33.7 (29.3-38.1)	38.3 (33.4-43.3)	28.8 (23.7-33.8)
Macedonia	9.8 (7.1-12.4)	9.7 (6.9-12.5)	9.8 (6.9-12.7)	x			2.3 (1.7-2.9)	24.9 (19.6-30.1)	11.8 (9.5-14.2)	11.9 (9.4-14.4)	11.7 (8.9-14.6)
Moldova	11.3 (9.2-13.5)	18.5 (14.7-22.3)	5.6 (4.1-7.0)	x			5.4 (4.0-6.7)	50.6 (42.4-58.9)	13.4 (11.2-15.5)	20.7 (17.0-24.5)	7.1 (5.5-8.8)
Montenegro	5.1 (3.9-6.3)	5.7 (4.1-7.4)	4.4 (2.9-5.9)	x			2.3 (1.5-3.0)	46.1 (39.7-52.5)	6.3 (5.1-7.5)	6.6 (4.9-8.3)	5.9 (4.5-7.3)
Romania	13.5 (10.2-16.7)	17.6 (11.2-23.9)	9.5 (7.6-11.4)	x			1.2 (0.3-2.0)	8.8 (2.4-15.3)	14.4 (11.2-17.6)	18.4 (12.2-24.6)	10.4 (8.3-12.6)
Serbia	9.3 (6.5-12.1)	9.3 (5.8-12.8)	8.9 (6.3-11.5)	x			4.4 (3.1-5.6)	48.7 (42.1-55.4)	10.4 (7.7-13.1)	10.8 (7.2-14.4)	9.6 (7.3-11.9)
South-East Asian Region											
Bhutan	14.0 (11.7-16.3)	23.1 (18.8-27.4)	6.6 (4.5-8.7)	21.6 (18.3-25.0)	25.0 (21.5-28.4)	18.9 (14.1-23.7)	9.1 (6.8-11.3)	60.4 (49.4-71.4)	28.6 (24.5-32.8)	36.5 (31.3-41.7)	22.1 (17.6-26.5)
Myanmar	6.8 (4.5-9.1)	13.0 (8.1-17.9)	0.5 (0.0-1.1)	4.2 (2.8-5.7)	6.9 (4.3-9.4)	1.4 (0.6-2.2)	3.1 (2.0-4.2)	31.6 (23.3-40.0)	13.3 (10.1-16.4)	22.8 (16.9-28.7)	3.3 (1.6-5.0)
Sri Lanka	1.5 (0.8-2.3)	2.8 (1.5-4.2)	0.3 (0.1-0.5)	2.5 (1.9-3.1)	3.0 (2.1-3.9)	1.8 (1.1-2.4)	0.8 (0.4-1.2)	21.0 (15.0-27.0)	4.7 (3.7-5.8)	6.3 (4.7-7.9)	3.1 (2.2-4.0)
Thailand	11.7 (10.1-13.3)	20.1 (17.5-22.8)	3.8 (2.9-4.7)	5.7 (2.8-8.5)	7.3 (3.9-10.7)	4.1 (1.6-6.6)	7.0 (4.2-9.8)	36.5 (32.8-40.3)	17.9 (14.8-21.0)	26.9 (23.1-30.7)	9.2 (6.5-11.8)
Timor-Leste	28.9 (21.5-36.4)	53.5 (38.6-68.5)	11.0 (7.0-15.0)	8.4 (6.3-10.5)	7.7 (4.5-10.8)	9.3 (6.4-12.1)	7.9 (6.0-9.7)	30.7 (21.2-40.2)	28.8 (22.7-35.0)	38.4 (27.6-49.1)	18.6 (15.2-22.1)
Western Pacific Region											

Cambodia	0.2 (0.0-0.3)	0.4 (0.0-0.8)	-	4.5 (2.9-6.1)	5.6 (3.2-7.9)	3.5 (1.8-5.2)	1.6 (0.4-2.8)		6.3 (4.2-8.5)	7.9 (5.1-10.7)	5.0 (2.8-7.1)
Fiji	8.5 (5.6-11.5)	12.8 (7.6-18.0)	5.8 (3.4-8.2)	x			1.9 (1.0-2.8)	23.5 (17.3-29.7)	13.0 (9.4-16.6)	17.5 (12.6-22.4)	10.1 (6.7-13.5)
Kiribati	19.8 (16.4-23.1)	26.3 (21.6-31.0)	13.9 (10.2-17.5)	31.2 (27.8-34.5)	37.3 (30.3-44.2)	25.9 (22.5-29.2)	17.5 (14.7-20.3)	70.7 (61.7-79.6)	40.3 (36.8-43.9)	48.2 (41.1-55.2)	33.5 (29.4-37.6)
Malaysia	18.2 (14.2-22.1)	30.9 (24.7-37.1)	5.3 (3.1-7.5)	4.0 (2.7-5.3)	4.5 (2.7-6.4)	3.2 (1.9-4.5)	5.1 (3.8-6.5)	24.5 (18.0-31.0	22.6 (18.4-26.9)	35.0 (28.9-41.2)	9.4 (6.5-12.4)
Marshall Islands	13.3 (9.4-17.1)	17.0 (10.3-23.8)	10.6 (4.7-16.5)	x			6.2 (3.6-8.8)	51.0 (32.7-69.2)	25.7 19.0-32.4)	29.4 (19.8-38.9)	21.3 (12.9-29.8)
Micronesia	28.3 (23.7-33.0)	36.9 (29.5-44.3)	19.8 (15.5-24.2)	x			14.9 (11.3-18.5)	59.4 (51.8-67.0)	45.7 (40.4-51.0)	51.5 (43.3-59.6)	39.6 (34.5-44.8)
Mongolia	3.9 (3.1-4.8)	5.9 (4.5-7.3)	1.9 (1.1-2.8)	9.5 (8.0-11.1)	13.6 (11.1-16.1)	5.7 (4.5-6.8)	2.6 (1.9-3.4)	58.0 (49.7-66.3)	13.3 (11.5-15.0)	18.8 (16.1-21.5)	7.8 (6.3-9.2)
Papua New Guinea	43.8 (39.4-48.1)	52.1 (47.3-56.8)	35.8 (29.7-41.9)	x			10.1 (7.7-12.6)	24.1 (19.0-29.2)	47.6 (43.7-51.6)	55.4 (51.0-59.7)	40.2 (34.7-45.7)
Philippines	8.9 (7.3-10.4)	12.9 (10.1-15.8)	5.3 (3.4-7.1)	4.5 (3.6-5.4)	5.8 (4.4-7.3)	3.3 (2.4-4.1)	2.8 (2.2-3.4)	21.2 (15.3-27.0)	13.7 (12.0-15.4)	18.8 (15.9-21.6)	9.3 (7.2-11.3)
Samoa	15.2 (11.0-19.3)	16.0 (8.8-23.1)	12.7 (7.3-18.2)	x			5.6 (3.5-7.7)	42.5 (30.9-54.2)	23.1 (18.3-27.9)	25.5 (18.2-32.7)	20.3 (15.7-25.0)
Solomon Islands	24.2 (17.4-31.0)	24.3 (16.3-32.4)	23.4 (15.4-31.4)	x			8.7 (5.0-12.5)	39.6 (28.7-50.5)	36.4 (30.7-42.0)	40.1 (30.3-49.9)	33.7 (25.1-42.3)

Tonga	27.1 (21.0-33.2)	37.5 (27.4-47.7)	18.9 (13.1-24.6)	14.2 (10.7-17.8)	17.2 (12.1-22.3)	12.3 (6.9-17.7)	14.1 (10.1-18.1)	42.5 (29.9-55.1)	35.6 (30.3-40.9)	44.9 (36.3-53.6)	28.0 (21.8-34.3)
Vanuatu	18.2 (15.3-21.1)	28.2 (23.4-33.0)	11.4 (8.4-14.4)	x			5.0 (3.6-6.3)	29.5 (22.8-36.2)	25.6 (22.8-28.4)	34.1 (29.4-38.7)	19.6 (16.5-22.6)

[a]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study
[b]CI: Confidence Interval
[x]Data not available

Table 3. Prevalence of cigarette smoking, smokeless tobacco, poly-tobacco and any tobacco use among adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[a] by sex, cigarette brand[b], geographical region[c], and country income classification[d]

Characteristics	Current Cigarette Smoking (n=15,712) Prevalence % (95% CI[e])	Current Smokeless Tobacco Use (n=5,984) Prevalence % (95% CI)	Poly-tobacco Use among all respondents (n=7,076) Prevalence % (95% CI)	Poly-tobacco Use among Current Cigarette Smokers (n=5,425) Prevalence % (95% CI)	Any tobacco Use (n=27,794) Prevalence % (95% CI)
Sex					
Male	12.5% (11.4-13.6)	6.3% (5.5-7.1)	5.3% (4.6-5.9)	33.5% (30.6-36.3)	21.4% (20.1-22.7)
Female	4.6% (4.1-5.2)	4.1% (3.5-4.6)	2.3% (1.9-2.6)	32.0% (28.2-35.7)	11.1% (10.2-11.9)
Cigarette brand					
No usual brand	37.4% (33.1-41.6)			31.0% (26.7-35.3)	
Usual brand	85.7% (84.0-87.5)			33.9% (31.1-36.6)	
Geographic Region					
European Region	11.5% (10.5-12.5)		2.6% (2.3-3.0)	23.9% (21.0-26.8)	13.5% (12.5-14.4)
African Region	9.7% (8.7-10.6)	10.5% (8.1-12.8)	3.3% (2.9-3.8)	31.3% (28.6-34.0)	18.3% (16.8-19.8%)
Region of the Americas	9.8% (8.7-10.8)	5.0% (4.3-5.7)	3.9% (3.3-4.4)	29.9% (26.8-32.9)	16.3% (15.0-17.5)

Eastern Mediterranean Region	5.2% (4.1-6.3)	5.5% (4.4-6.6)	4.3% (3.4-5.3)	57.4% (50.3-64.5)	17.5% (15.4-19.7)
South-East Asian Region	8.8% (7.8-9.9)	4.8% (3.1-6.5)	5.0% (3.3-6.6)	35.0% (31.9-38.2)	14.5% (12.6-16.4)
Western Pacific Region	10.1% (8.7-11.4)	4.5% (3.8-5.2)	3.2% (2.7-3.7)	23.1% (19.1-27.0)	15.1% (13.6-16.5)
Country classification by Income					
Low Income	6.5% (5.6-7.3)	6.4% (5.3-7.5)	2.8% (2.3-3.2)	30.7% (27.3-34.0)	14.0% (12.6-15.4)
Lower Middle Income	7.3% (6.4-8.2)	5.1% (4.4-5.9)	4.1% (3.4-4.7)	37.4% (33.6-41.3)	15.9% (14.6-17.2)
Upper Middle Income	12.8% (11.7-13.8)	4.7% (4.0-5.4)	3.9% (3.5-4.3)	28.6% (25.7-31.4)	18.6% (17.5-19.6)

[a]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study
[b]Cigarette brand based on brand preference (usual or no usual brand preference)
[c]Geographical regions grouped by the World Health Organization into 6 regions
[d]Country income classification evaluated using the country's gross national income provided by the World Bank
[e]CI: Confidence Interval

Table 4.1. Association between sex, cigarette brand[a], geographical regions[b] country income classification[c], and cigarette smoking among adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[d]

Characteristics	N	Current Cigarette Smokers, N = 15,712		
		Unadjusted OR (95% CI[e])	Adjusted OR (95% CI)	Adjusted Prevalence Ratio (95% CI)
Sex				
Male	9,461	1.00[ref]	1.00[ref]	1.00[ref]
Female	5,898	0.34 (0.30-0.39)	0.56 (0.47-0.67)	0.87 (0.83-0.91)
Cigarette brand				
No usual brand	2,259	1.00[ref]	1.00[ref]	1.00[ref]
Usual brand	11,174	10.06 (7.98-12.69)	8.60 (6.97-10.63)	2.11 (1.88-2.37)
Geographic Region				
European Region	5,305	1.00[ref]	1.00[ref]	1.00[ref]
African Region	2,989	1.19 (1.03-1.39)	0.71 (0.54-0.93)	0.92 (0.85-0.98)
Region of the Americas	1,722	1.17 (1.01-1.37)	0.48 (0.36-0.63)	0.86 (0.80-0.93)
Eastern Mediterranean Region	941	0.50 (0.38-0.65)	1.01 (0.71-1.42)	1.02 (0.95-1.10)
South-East Asian Region	1,558	1.05 (0.88-1.27)	0.92 (0.59-1.43)	0.99 (0.91-1.07)

Western Pacific Region	3,197	1.29 (1.09-1.53)	0.86 (0.59-1.24)	0.95 (0.89-1.01)
Country Classification by Income				
Low Income	2,340	1.00[ref]	1.00[ref]	1.00[ref]
Lower Middle Income	5,407	0.71 (0.61-0.82)	0.97 (0.70-1.35)	1.00 (0.91-1.10)
Upper Middle Income	7,965	1.92 (1.68-2.19)	1.69 (1.23-2.32)	1.16 (1.06-1.27)
Survey Year	2007-2014, range	1.04 (0.98-1.10)	1.06 (0.97-1.16)	1.03 (1.01-1.06)
Tobacco Tax[f]	44.4 (0, 77.8), median (min, max)	1.01 (1.01-1.02)	1.02 (1.02-1.03)	1.01 (1.00-1.01)

[a]Cigarette brand based on brand preference (usual or no usual brand preference)
[b]Geographical regions grouped by the World Health Organization into 6 regions
[c]Country income classification evaluated using the country's gross national income provided by the World Bank
[d]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study
[e]CI: Confidence Interval
[f]Tobacco excise tax obtained from WHO 2015 MPOWER Report
[ref]referent category

Table 4.2. Association between sex, geographical regions[a], country income classification[b], and smokeless tobacco among adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[c]

Predictor Characteristics	N	Current Smokeless Tobacco Use, N = 5,984		
		Unadjusted OR (95% CI[d])	Adjusted OR (95% CI)	Adjusted Prevalence Ratio (95% CI)
Sex				
Male	3,194	1.00[ref]	1.00[ref]	1.00[ref]
Female	2,639	0.63 (0.54-0.73)	0.62 (0.53-0.73)	0.64 (0.55-0.74)
GeographicRegion				
African Region	2,147	1.00[ref]	1.00[ref]	1.00[ref]
Region of the Americas	948	0.95 (0.79-1.16)	0.48 (0.35-0.64)	0.50 (0.38-0.66)
Eastern Mediterranean Region	502	1.07 (0.83-1.37)	0.47 (0.33-0.67)	0.49 (0.36-0.68)
South-East Asian Region	977	0.89 (0.61-1.30)	0.47 (0.28-0.79)	0.50 (0.31-0.80)
Western Pacific Region	1,410	0.79 (0.64-0.97)	0.43 (0.30-0.62)	0.46 (0.33-0.64)
Country Classification by Income				
Low Income	636	1.00[ref]	1.00[ref]	1.00[ref]
Lower Middle Income	3,549	0.92 (0.76-1.12)	1.18 (0.90-1.56)	1.17 (0.90-1.52)

Upper Middle Income	1,799	0.88 (0.72-1.08)	1.05 (0.78-1.40)	1.04 (0.79-1.37)
Survey Year, Range	2007-2014	0.94 (0.88-1.00)	1.03 (0.93-1.14)	1.03 (0.94-1.13)
Tobacco Tax[e], mean (95% CI)	39.59 (35.63-43.55)	1.00 (0.99-1.00)	1.00 (0.99-1.00)	1.00 (0.99-1.00)

[a]Geographical regions grouped by the World Health Organization into 6 regions

[b]Country income classification evaluated using the country's gross national income provided by the World Bank

[c]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study

[d]CI: Confidence Interval

[e]Tobacco excise tax obtained from WHO 2015 MPOWER Report

[ref]referent category

Table 4.3. Association between sex, geographical regions[a], country income classification[b], and poly-tobacco use among adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[c]

Predictor Characteristics	N	Poly-tobacco Use among all respondents, N = 7,076		
		Unadjusted OR (95% CI[d])	Adjusted OR (95% CI)	Adjusted Prevalence Ratio (95% CI)
Sex				
Male	4,228	1.00[ref]	1.00[ref]	1.00[ref]
Female	2,664	0.42 (0.36-0.50)	0.42 (0.36-0.50)	0.44 (0.37-0.52)
Geographic Region				
European Region	1,683	1.00[ref]	1.00[ref]	1.00[ref]
African Region	1,722	0.85 (0.71-1.03)	1.83 (1.48-2.27)	1.79 (1.44-2.21)
Region of the Americas	750	1.02 (0.84-1.24)	1.49 (1.22-1.83)	1.47 (1.19-1.81)
Eastern Mediterranean Region	681	1.22 (0.93-1.59)	1.84 (1.402-2.41)	1.80 (1.37-2.35)
South-East Asian Region	844	1.41 (0.98-2.03)	2.76 (1.78-4.29)	2.64 (1.73-4.02)
Western Pacific Region	1,396	0.80 (0.65-0.99)	1.66 (1.30-2.12)	1.63 (1.26-2.11)
Country Classification by Income				

Low Income	821	1.00[ref]	1.00[ref]	1.00[ref]
Lower Middle Income	3,416	1.22 (1.00-1.47)	1.71 (1.26-2.32)	1.67 (1.24-2.24)
Upper Middle Income	2,839	1.03 (0.87-1.23)	2.21 (1.67-2.91)	2.13 (1.62-2.80)
Survey Year	2007-2014, range	1.03 (0.98-1.10)	0.90 (0.83-0.98)	0.91 (0.84-0.98)
Tobacco Tax[e], mean (95% CI)	34.00 (0, 77.8), median (min, max)	1.00 (1.00-1.01)	1.00 (1.00-1.01)	1.00 (1.00-1.01)

[a]Geographical regions grouped by the World Health Organization into 6 regions
[b]Country income classification evaluated using the country's gross national income provided by the World Bank
[c]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study
[d]CI: Confidence Interval
[e]Tobacco excise tax obtained from WHO 2015 MPOWER Report
[ref]referent category

Table 4.4. Association between sex, cigarette brand[a], geographical regions[b], country income classification[c], and poly-tobacco use among adolescents who smoke cigarettes, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[d]

Predictor Characteristics	N	Poly-tobacco Use among current cigarette smokers, N = 5,425		
		Unadjusted OR (95% CI[e])	Adjusted OR (95% CI)	Adjusted Prevalence Ratio (95% CI)
Sex				
Male	3,397	1.00[ref]	1.00[ref]	1.00[ref]
Female	1,890	0.93 (0.75-1.16)	0.98 (0.77-1.23)	0.98 (0.84-1.14)
Cigarette brand				
No usual brand	774	1.00[ref]	1.00[ref]	1.00[ref]
Usual brand	3,795	1.14 (0.90-1.44)	1.28 (0.98-1.67)	1.16 (0.96-1.41)
Geographic Region				
European Region	1,683	1.00[ref]	1.00[ref]	1.00[ref]
African Region	941	0.90 (0.74-1.09)	1.41 (1.06-1.87)	1.31 (1.06-1.64)
Region of the Americas	489	0.85 (0.71-1.03)	1.12 (0.85-1.49)	1.14 (0.94-1.37)
Eastern Mediterranean Region	552	3.48 (2.41-5.03)	3.60 (2.39-5.42)	2.15 (1.69-2.75)
South-East Asian Region	1,683	1.10 (0.90-1.34)	1.87 (1.29-2.72)	1.53 (1.17-2.00)

Western Pacific Region	1,175	0.50 (0.39-0.64)	0.90 (0.64-1.27)	0.92 (0.70-1.21)
Country Classification by Income				
Low Income	655	1.00[ref]	1.00[ref]	1.00[ref]
Lower Middle Income	2,270	1.46 (1.17-1.81)	1.31 (0.86-2.00)	1.16 (0.92-1.47)
Upper Middle Income	2,500	0.71 (0.58-1.88)	1.20 (0.84-1.73)	1.12 (0.88-1.43)
Survey Year	2007-2014, range	0.95 (0.88-1.04)	1.03 (0.90-1.17)	1.02 (0.95-1.10)
Tobacco Tax[f], mean (95% CI)	44.13 (41.29-46.97)	0.99 (0.98-0.99)	0.99 (0.98-1.00)	0.99 (0.99-1.00)

[a]Cigarette brand based on brand preference (usual or no usual brand preference)
[b]Geographical regions grouped by the World Health Organization into 6 regions
[c]Country income classification evaluated using the country's gross national income provided by the World Bank
[d]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study
[e]CI: Confidence Interval
[f]Tobacco excise tax obtained from WHO 2015 MPOWER Report
[ref]referent category

Table 4.5. Association between sex, geographical regions[a], country income classification[b], and any tobacco use among adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[c]

Predictor Characteristics	N	Any Tobacco Use, N = 27,794		
		Unadjusted OR (95% CI[d])	Adjusted OR (95% CI)	Adjusted Prevalence Ratio (95% CI)
Sex				
Male	15,702	1.00[ref]	1.00[ref]	1.00[ref]
Female	11,452	0.46 (0.41-0.51)	0.45 (0.41-0.50)	0.52 (0.47-0.56)
Geographic Region				
European Region	6,547	1.00[ref]	1.00[ref]	1.00[ref]
African Region	7,255	1.20 (1.06-1.36)	2.01 (1.74-2.33)	1.77 (1.57-2.01)
Region of the Americas	3,350	1.01 (0.89-1.13)	1.25 (1.10-1.42)	1.20 (1.07-1.36)
Eastern Mediterranean Region	2,611	1.15 (0.98-1.34)	1.48 (1.27-1.73)	1.38 (1.21-1.57)
South-East Asian Region	2,635	0.86 (0.72-1.02)	1.70 (1.35-2.15)	1.54 (1.27-1.87)
Western Pacific Region	5,396	0.89 (0.79-1.02)	1.65 (1.39-1.97)	1.50 (1.31-1.73)
Country Classification by Income				
Low Income	4,681	1.00[ref]	1.00[ref]	1.00[ref]

Lower Middle Income	10.838	0.95 (0.85-1.06)	1.65 (1.35-2.00)	1.51 (1.28-1.78)
Upper Middle Income	12,275	1.25 (1.13-1.38)	2.19 (1.83-2.62)	1.90 (1.63-2.21)
Survey Year	2007-2014, range	0.93 (0.89-0.97)	0.91 (0.86-0.95)	0.92 (0.89-0.96)
Tobacco Tax[e], mean (95% CI)	39.59 (36.73-42.45)	1.00 (0.99-1.00)	1.00 (0.99-1.00)	1.00 (0.99-1.00)

[a]Geographical regions grouped by the World Health Organization into 6 regions
[b]Country income classification evaluated using the country's gross national income provided by the World Bank
[c]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study
[d]CI: Confidence Interval
[e]Tobacco excise tax obtained from WHO 2015 MPOWER Report
[ref]referent category

Table 4.6. Association between sex, cigarette brand[a], geographical regions[b], country income classification[c], and tobacco use among adolescents, aged 13-15 years, in 75 low and middle income countries from the Global Youth Tobacco Survey, 2007 – 2014[d]

Predictor Characteristics	Current Cigarette Smoking (n=15,712) aOR (95% CI[e])	Poly-tobacco Use among all respondents (n=7,076) aOR (95% CI)	Poly-tobacco Use among Current Cigarette Smokers (n=5,425) aOR (95% CI)	Any tobacco Use (n=27,794) aOR (95% CI)	Current Smokeless tobacco Use (n=5,984) aOR (95% CI)
Sex					
Male	1.00[ref]	1.00[ref]	1.00[ref]	1.00[ref]	1.00[ref]
Female	0.56 (0.47-0.67)	0.42 (0.36-0.50)	0.98 (0.77-1.23)	0.45 (0.41-0.50)	0.62 (0.53-0.73)
Cigarette brand					
No usual brand	1.00[ref]		1.00[ref]		
Usual brand	8.60 (6.97-10.63)		1.28 (0.98-1.67)		
Geographic Region					
European Region	1.00[ref]	1.00[ref]	1.00[ref]	1.00[ref]	-
African Region	0.71 (0.54-0.93)	1.83 (1.48-2.27)	1.41 (1.06-1.87)	2.01 (1.74-2.33)	1.00[ref]
Region of the Americas	0.48 (0.36-0.63)	1.49 (1.22-1.83)	1.12 (0.85-1.49)	1.25 (1.10-1.42)	0.48 (0.35-0.64)
Eastern Mediterranean Region	1.01 (0.71-1.42)	1.84 (1.40-2.41)	3.60 (2.39-5.42)	1.48 (1.27-1.73)	0.47 (0.33-0.67)

South-East Asian Region	0.92 (0.59-1.43)	2.76 (1.78-4.29)	1.87 (1.29-2.72)	1.70 (1.35-2.15)	0.47 (0.28-0.79)
Western Pacific Region	0.86 (0.59-1.24)	1.66 (1.30-2.12)	0.90 (0.64-1.27)	1.65 (1.39-1.97)	0.43 (0.30-0.62)
Country Classification by Income					
Low Income	1.00[ref]	1.00[ref]	1.00[ref]	1.00[ref]	1.00[ref]
Lower Middle Income	0.97 (0.70-1.35)	1.71 (1.26-2.32)	1.31 (0.86-2.00)	1.65 (1.35-2.00)	1.18 (0.90-1.56)
Upper Middle Income	1.69 (1.23-2.32)	2.21 (1.67-2.91)	1.20 (0.84-1.73)	2.19 (1.83-2.62)	1.05 (0.78-1.40)
Survey Year	1.06 (0.97-1.16)	0.90 (0.83-0.98)	1.03 (0.90-1.17)	0.91 (0.86-0.95)	1.03 (0.93-1.14)
Tobacco Tax[f]	1.02 (1.02-1.03)	1.00 (1.00-1.01)	0.99 (0.98-1.00)	1.00 (0.99-1.00)	1.00 (0.99-1.00)

[a]Cigarette brand based on brand preference (usual or no usual brand preference)
[b]Geographical regions grouped by the World Health Organization into 6 regions
[c]Country income classification evaluated using the country's gross national income provided by the World Bank
[d]Only low and middle income countries with GYTS data obtained between 2007 and 2014 were included in this study
[e]CI: Confidence Interval
[f]Tobacco excise tax obtained from WHO 2015 MPOWER Report
[ref]referent category