

# Smoking prevalence in WHO Member States

Monitoring the prevalence of tobacco use is central to efforts to control the global tobacco epidemic. Reliable prevalence data on the magnitude of the tobacco epidemic and its influencing factors provide the information needed to plan, adopt and evaluate the impact of tobacco control interventions. This report contains survey data for both smoking<sup>1</sup> and smokeless tobacco use among young people and adults (Appendix II). It also presents WHO-modelled, age-standardized prevalence estimates for smoking for people aged 15 years and over (Appendix II). This technical note provides information on the method used to generate the WHO smoking prevalence estimates.

## Sources of information

For the analysis, the following sources of information were explored (where official survey reports explaining the sampling, methodology and detailed results were not publicly available, Member States were asked to provide them):

- information on surveys provided by Parties to the WHO FCTC Secretariat;
- information collected through WHO tobacco-focussed surveys conducted under the aegis of the Global Tobacco Surveillance System – in particular, the Global Adult Tobacco Survey (GATS);
- tobacco information collected through other WHO surveys including WHO STEPwise surveys and World Health Surveys;
- other systems-based surveys undertaken by other organizations, including surveys such as the Demographic and Health Surveys (DHS) and the Multiple Indicator Cluster Survey (MICS); and

- an extensive search through WHO regional offices and WHO country offices to identify country-specific surveys not part of international surveillance systems – such as the Survey of Lifestyles, Attitudes and Nutrition in the Republic of Ireland, or the Mauritius Non Communicable Diseases Survey.

For the analysis, information from surveys conducted since 1990 was used if it:

- was officially recognized by the national health authority;
- included randomly selected participants who were representative of the general population;
- provided country survey summary data for one or more of six tobacco use definitions: daily tobacco user, current tobacco user, daily tobacco smoker, current tobacco smoker, daily cigarette smoker or current cigarette smoker; and
- presented prevalence values by age and sex.

The above indicators provide for the most complete representation of tobacco smoking across countries and at the same time help minimize attrition of countries from further analysis because of lack of adequate data. Although differences exist in the types of tobacco products used in different countries and grown or manufactured in different regions of the world, data on tobacco smoking are the most widely reported and are common to all countries, thereby permitting statistical analyses.<sup>2</sup>

The information identified above is stored in the WHO Tobacco Control Global DataBank and, along with the source code used for generating the WHO smoking prevalence estimates, is available at <http://www.who.int/tobacco/surveillance/globaldatabank/>.

## Analysis and presentation of smoking prevalence indicators

### Estimation method

A statistical model based on a Bayesian negative binomial meta-regression was used to model crude and age-specific estimates for countries for four indicators of tobacco smoking (current and daily tobacco smoking and current and daily cigarette smoking) separately for men and women. A trend was considered to be statistically significant if the posterior probability of the increase or decrease was greater than 0.75. A full description of the method is available as a peer-reviewed article in *The Lancet*, volume 385, No. 9972, p966–976 (2015).

Once the prevalence rates from national surveys were compiled into a dataset, the model was fit to calculate trend estimates for the indicators specified above. The model has two main components: (a) adjusting for missing indicators and age groups, and (b) running the regression model to generate an estimate of trends over time as well as the 95% credible interval around the estimate.

Depending on the completeness of survey data from a particular country, the model at times makes use of data from other countries to fill information gaps. Countries with less data or broadly inadequate data “borrow information” from neighbouring countries<sup>3</sup> in the calculation of their estimates.

### Differences in age groups covered by each survey

Survey results for any one country were sometimes reported for a variety of different age groups. Where data were

missing for any age group in the range of 15 years and above, the model uses available data from a country's other surveys to estimate the age pattern of tobacco use. For ages that the country has never surveyed, the average age pattern seen in countries in the same geographical region is applied to the country's data.

#### **Differences in the indicators of tobacco use measured**

Similarly, countries may report different indicators across surveys (e.g. current smoking in one survey and daily smoking in another, or tobacco smoking in one and cigarette smoking in another). Where data were missing for any indicator, the model uses available data from a country's other surveys to estimate the missing information. For indicators on which the country has never reported, the average relationships seen in countries in the same geographical region are applied to the country's data.

#### **Modelled results**

The model was run for all countries with surveys that met the inclusion criteria. Results for countries with insufficient survey data (i.e. only one survey with a detailed age breakdown for prevalence for either sex) were not reported.

The output of the model is a set of trend lines for each country that summarize its prevalence history from 2000 to 2015, as revealed by available survey data. Countries with few surveys reporting smoking will have more borrowed information blended into their trend line than countries with many surveys.

For this report, country-level trends have been summarized into average trends for high-income countries, middle-income countries, low-income countries and a global average. Trends from 2000 to 2015 are presented, with projections of the same

lines to 2030. The projection assumes that the pace and level of adoption of new policies during the period 1990 to 2015 will continue unchanged. In future, when countries adopt stronger tobacco control policies and complete new surveys, recalculated trend lines will reflect the changes.

In this report comparable estimates of current tobacco smoking among people aged 15 years and over are presented for all countries in one year (2015). These rates are taken from the trend line for each country for the year 2015. The rates are comparable because the model has standardized the survey results as described above, and then age-standardized as described below.

When calculating global and World Bank income group average prevalence rates, countries without estimates were included in the averages by assuming their prevalence rates are the average rates seen in the UN subregion to which they belong.<sup>3</sup>

#### **Age-standardized prevalence rates**

Comparison of crude rates between two or more countries at one point in time, or of one country at different points in time, can be misleading if the two populations being compared have significantly different age distributions or differences in tobacco use by sex. The method of age-standardization is commonly used to overcome this problem and allows for meaningful comparison of prevalence between countries, once all other comparison issues described have been addressed. The method involves applying the age-specific rates by sex in each population to one standard population (this report uses the WHO Standard Population, a fictitious population whose age distribution is largely reflective of the population age structure of low- and middle-income countries).

The resulting age-standardized rates refer to the number of smokers per 100 WHO Standard Population. As a result, the rates generated using this process are only hypothetical numbers with no inherent meaning. They are only meaningful when comparing rates obtained from one country with those obtained in another country.

### **Comparison with smoking estimates in earlier editions of this report**

The estimates in this report are consistent with each other but not with estimates produced for earlier editions of this report. While the method of estimation is the same, the updated data set for the period 1990–2016 is much more complete.

For example, since the *WHO report on the global tobacco epidemic, 2015*, 189 national surveys from 100 countries have been added to the data set, and 48 existing surveys have been updated with additional data points. Each round of WHO smoking prevalence trend estimates is calculated using all available survey data back to 1990. The more data points available to the model, the more robust the trend estimates are. Each estimation round therefore improves upon earlier published estimates, and only the latest round should be used. While country-level estimates in this report pertain only to 2015, the entire trend series from 2000 to 2025 is published in the biennial *WHO global report on trends in tobacco smoking 2000–2025*.

### **Trends in tobacco use among young people aged 13–15 years**

Tobacco use prevalence among school children aged 13–15 years has been measured at national level at two or more

points in time in 108 countries using the Global Youth Tobacco Survey. Since the method, sample, questions and indicators reported are consistent across time, these surveys could be used to calculate trends in current tobacco use among school children aged 13–15. The set of data points with metadata is available at <http://www.who.int/tobacco/surveillance/globaldatabank/>.

Trends in boys' and girls' tobacco use prevalence were assessed separately for each of the 108 countries. For this report, countries with 3 or more years of data were classified as having registered an increase (or decrease) in prevalence if the coefficient from a simple linear regression of the point estimate of prevalence on survey year was positive (or negative) and significantly different from zero at the 5% level, and as having registered no change if the coefficient was not significantly different from zero at the 5% level. In the case of countries with only two data points, a test of difference of proportions was conducted with the simplifying assumption of equal sample sizes of 1000 boys and 1000 girls in the start and final year of the survey in each country, with no assumptions made about the hierarchical structure of survey data. Countries were classified as having registered an increase (or decrease) according to whether the change in prevalence from the first to the latest survey was positive (or negative) and significantly different from zero at the 5% level.

- 1 Tobacco smoking includes cigarette, cigar, pipe, hookah, shisha, water-pipe and any other form of smoked tobacco.
- 2 For countries where prevalence of smokeless tobacco use is reported, we have published these data.
- 3 For a complete listing of countries by UN region, please refer to pages ix to xiii of *World Population Prospects: The 2015 Revision*, published by the UN Department of Economic and Social Affairs in 2015 at [https://esa.un.org/unpd/wpp/Publications/Files/WPP2015\\_Volume-I\\_Comprehensive-Tables.pdf](https://esa.un.org/unpd/wpp/Publications/Files/WPP2015_Volume-I_Comprehensive-Tables.pdf) (accessed May 25, 2017). Please note that, for the purposes of smoking analysis, the following adjustments were made: (i) Eastern Africa subregion was divided into two regions: Eastern Africa Islands and Remainder of Eastern Africa; (ii) Armenia, Azerbaijan, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Tajikistan, Uzbekistan and Turkmenistan were classified with Eastern Europe, (iii); Cyprus, Israel and Turkey were classified with Southern Europe, and (iv) Melanesia, Micronesia and Polynesia subregions were combined into one subregion. When summarising the results, Middle Africa and Southern Africa were combined because only one country in Middle Africa had sufficient data to calculate a trend.