# Tobacco use in 3 billion individuals from 16 countries: an analysis of nationally representative cross-sectional household surveys

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## Summary

**Background** **Despite the high global burden of diseases caused by tobacco, valid and comparable prevalence data for patterns of adult tobacco use and factors influencing use are absent for many low-income and middle-income countries. We assess these patterns through analysis of data from the Global Adult Tobacco Survey (GATS).**

**Methods** **Between Oct 1, 2008, and March 15, 2010, GATS used nationally representative household surveys with comparable methods to obtain relevant information from individuals aged 15 years or older in 14 low-income and middle-income countries (Bangladesh, Brazil, China, Egypt, India, Mexico, Philippines, Poland, Russia, Thailand, Turkey, Ukraine, Uruguay, and Vietnam). We compared weighted point estimates and 95% CIs of tobacco use between these 14 countries and with data from the 2008 UK General Lifestyle Survey and the 2006–07 US Tobacco Use Supplement to the Current Population Survey. All these surveys had cross-sectional study designs.**

**Findings** **In countries participating in GATS, 48·6% (95% CI 47·6–49·6) of men and 11·3% (10·7–12·0) of women were tobacco users. 40·7% of men (ranging from 21·6% in Brazil to 60·2% in Russia) and 5·0% of women (0·5% in Egypt to 24·4% in Poland) in GATS countries smoked a tobacco product. Manufactured cigarettes were favoured by most smokers (82%) overall, but smokeless tobacco and bidis were commonly used in India and Bangladesh. For individuals who had ever smoked daily, women aged 55–64 years at the time of the survey began smoking at an older age than did equivalently aged men in most GATS countries. However, those individuals who had ever smoked daily and were aged 25–34-years when surveyed started to do so at much the same age in both sexes. Quit ratios were very low (<20% overall) in China, India, Russia, Egypt, and Bangladesh.**

**Interpretation** **The first wave of GATS showed high rates of smoking in men, early initiation of smoking in women, and low quit ratios, reinforcing the view that efforts to prevent initiation and promote cessation of tobacco use are needed to reduce associated morbidity and mortality.**

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## Introduction

Tobacco use has long been a leading contributor to premature death, and causes about 9% of deaths worldwide.[1] Presently, the burden of tobacco use is greatest in high-income countries (18% of deaths are attributable to tobacco use), intermediate in middle-income countries (11%), and lowest in low-income countries (4%).[1] However, because rates of smoking are increasing in many low-income and middle-income countries (and decreasing in most high-income countries), the proportion of deaths from tobacco use could increase in low-income and middle-income countries as the number of tobacco-attributable deaths increases.[1,2] According to WHO, nearly 6 million people die from tobacco-related causes every year.[2] If present patterns of use persist, tobacco use could cause as many as 1 billion premature deaths globally during the 21st century.[2]

Although most of the tobacco that is consumed throughout the world is in the form of manufactured cigarettes, it is also smoked in other products, such as cigars, cigarillos, pipes, waterpipes, kreteks (clove cigarettes), bidis (tobacco in a tendu or temburni leaf that is tied with a cotton thread), and papirosy (cardboard tube-tipped cigarettes).[3] Waterpipes are commonly used in Middle Eastern countries and some Asian countries. Kreteks are the dominant tobacco product consumed in Indonesia and bidis are smoked widely in the Indian subcontinent (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka). Papirosy are smoked in Russia. Many types of smokeless tobacco products exist. Various forms of loose-leaf chewed tobacco are commonly consumed in the Indian subcontinent. For example, betel quid is made of tobacco, areca nut, slaked lime, and flavouring agents, all of which are wrapped in a betel leaf. Snuff (finely-chopped tobacco) is used in many countries and in some is branded with the names of leading cigarette varieties.

As for any major cause of disease, monitoring of tobacco use around the world is imperative. Accurate documentation of tobacco use by population-based surveys

facilitates understanding of disease patterns, provides an indication of the effectiveness of tobacco-control strategies and how they should be changed, and points to programmatic and research needs.[4] The Global Tobacco Surveillance System was created by WHO, the US Centers for Disease Control and Prevention (CDC), and the Canadian Public Health Association[5] "to enhance country capacity to design, implement and evaluate tobacco-control interventions, and monitor key articles of the WHO's Framework Convention on Tobacco Control and components of the WHO MPOWER technical package."[6] Such activities are required by WHO's Framework Convention on Tobacco Control,[7] which is a broad treaty for global tobacco control. We report indicators of use and cessation from the first wave of the Global Adult Tobacco Survey (GATS), which was recently undertaken in 14 low-income and middle-income countries (Bangladesh, Brazil, China, Egypt, India, Mexico, Philippines, Poland, Russia, Thailand, Turkey, Ukraine, Uruguay, and Vietnam) that collectively contribute to most of the disease burden attributable to tobacco use. For comparison, we include data from nationally representative surveys in the UK and USA, and thus provide nationally representative data on tobacco use in 16 countries with a total population of about 3 billion individuals aged 15 years or older.

## Methods

### Study design and participants

Detailed descriptions of GATS,[8,9] the UK General Lifestyle Survey,[10] and the US Tobacco Use Supplement to the Current Population Survey[11] (hereafter referred to as the Tobacco Use Supplement) are available elsewhere (appendix p 2). Even though the General Lifestyle Survey did not sample in Northern Ireland, we refer to it as a UK survey for reasons of simplicity.

GATS is a household-based survey, designed to obtain nationally representative data in low-income and middle-income countries for the tobacco use behaviours of civilian, non-institutionalised individuals aged 15 years and older.[8,9] Wave 1 focused on countries with large numbers of tobacco users and included Uruguay to help assess its recent tobacco-control activities. Residents from all regions of every nation were eligible to be sampled, apart from those living in remote or dangerous areas, as determined by each country's implementing agency. A minimum sample size of 8000 households in each country was recommended so that any prevalence estimate of less than 40% would have a 95% margin of error of no greater than 3 percentage points.[8] Sample sizes in the four countries that made regional estimates (India, Brazil, Egypt, and Thailand) were much larger than were those that did not make such estimates. Sample sizes varied because of resource availability and individual country needs.

Each GATS country used a stratified multistage cluster sampling design in which the probability of a given cluster being selected was proportional to its population size. Multiple households in selected areas were selected at random. In each selected household, the electronic handheld device that was used for household rostering and data collection used a random number generator to identify one household member to be interviewed. Face-to-face interviews were done in the participant's local language between Oct 1, 2008, and March 15, 2010, with a handheld electronic data collection device. Interviews were done privately, and in countries where culturally required (eg, Bangladesh, Egypt, India) same-sex interviewers were used. Appendix p 3 describes the years in which data collection occurred, response rates, and the number of respondents for each country's survey. The fieldwork for each GATS country was completed within about 1–6 months.

Ethics review and approval was undertaken and obtained in collaboration with each country's implementing agency and Ministry of Health guidelines.

### Procedures

15 indicators of tobacco use (panel 1) were constructed from GATS questions (appendix pp 4–5). Of these 15 indicators, many were constructed from equivalent indicators in the General Lifestyle Survey[10] and the Tobacco Use Supplement[11] to allow comparisons to be made. In all surveys, quality-assurance procedures were incorporated to improve data quality, as described elsewhere.[8–11] In GATS, for example, expert committees reviewed questionnaire content and sampling procedures in every country.

See Online for appendix

***Panel 1:*** **Indicators of tobacco use in the Global Adult Tobacco Survey (GATS)**

- Current smoking: currently smoking any tobacco product on a daily or less than daily basis
- Current daily smoking: currently smoking any tobacco product on a daily basis
- Cigarette smoking: currently smoking cigarettes (manufactured or hand-rolled but not bidis)
- Smoking manufactured cigarettes (including kreteks and papirosy)
- Smoking hand-rolled cigarettes
- Smoking manufactured and hand-rolled cigarettes
- Smoking tobacco products other than cigarettes (eg, cigars, bidis, or waterpipes)
- Daily cigarette smoking: smoking manufactured or hand-rolled cigarettes every day
- Mean number of cigarettes smoked per day among daily cigarette smokers
- Current smokeless tobacco use: using any smokeless tobacco product on a daily or less than daily basis
- Any current tobacco use: currently smoking or using smokeless tobacco
- Ever smoking: ever tried smoking any tobacco product
- Ever daily smoking: ever smoked any tobacco product on a daily basis
- Age of initiation of daily smoking: age when respondent first smoked every day
- Former smoking among ever daily smokers (ie, quit ratio): the percentage of persons who ever smoked daily who no longer smoke

The word "smoking" includes smoking of any tobacco product, such as manufactured cigarettes, hand-rolled cigarettes, kreteks, papirosy, bidis, cigars, pipes, or waterpipes. "Tobacco use" includes smoking and smokeless tobacco use. Some individuals who smoke tobacco also use smokeless tobacco products and some individuals who use smokeless tobacco products also smoke. Further details on the questionnaires used and indicator definitions for GATS, the General Lifestyle Survey,[10] and the Tobacco Use Supplement[11] are available in appendix pp 4–5.

| | China | India | Bangladesh | Vietnam | Philippines | Thailand | Russia | Ukraine | Poland | Egypt | Turkey | Brazil | Mexico | Uruguay | UK | USA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Men (≥15 years)** | | | | | | | | | | | | | | | | |
| Sample size | 6603 | 33767 | 4468 | 4356 | 4740 | 10052 | 6217 | 4076 | 3867 | 10062 | 4269 | 18039 | 6160 | 2634 | 6695 | 75838 |
| Population estimate, millions | 544·5 (484·3–604·6) | 411·1 (393·6–428·7) | 47·4 (44·9–50·0) | 31·3 (30·2–32·3) | 30·6 (29·2–31·9) | 25·6 (24·8–26·3) | 50·8 (48·4–53·3) | 18·2 (17·6–18·7) | 15·4 (14·9–16·0) | 25·3 (23·7–26·9) | 25·1 (24·3–25·9) | 68·5 (65·2–71·8) | 32·8 (29·4–36·2) | 1·2 (1·1–1·2) | 19·5 (18·8–20·2) | 111·9 (111·8–112·1) |
| Current smoking, % | 52·9 (50·6–55·2) | 24·3 (23·3–25·3) | 44·7 (42·5–47·0) | 47·4 (45·4–49·4) | 47·6 (45·7–49·6) | 45·6 (43·8–47·4) | 60·2 (58·4–62·0) | 50·0 (48·1–52·0) | 36·9 (34·9–38·9) | 37·6 (36·3–39·0) | 47·9 (45·9–50·0) | 21·6 (20·8–22·4) | 24·8 (23·2–26·6) | 30·7 (28·2–33·4) | 22·8 (21·6–24·2) | 24·0 (23·6–24·3) |
| Daily smoking, % | 45·4 (42·8–48·0) | 18·3 (17·4–19·3) | 40·7 (38·5–42·9) | 38·7 (36·9–40·6) | 38·2 (36·4–40·2) | 39·2 (37·5–41·0) | 55·0 (53·1–56·8) | 45·5 (43·6–47·4) | 33·5 (31·6–35·5) | 35·8 (34·5–37·2) | 43·8 (41·8–45·9) | 18·9 (18·2–19·6) | 11·8 (10·7–13·1) | 24·8 (22·5–27·3) | NA* | 16·4 (16·1–16·8) |
| Cigarette smoking†, % | 52·1 (49·7–54·5) | 10·5 (9·8–11·2) | 28·3 (26·3–30·4) | 39·7 (37·5–41·9) | 47·2 (45·3–49·2) | 45·4 (43·6–47·2) | 59·8 (58·0–61·5) | 49·7 (47·8–51·7) | 36·7 (34·8–38·7) | 31·8 (30·6–33·1) | 47·8 (45·7–49·9) | 21·4 (20·6–22·1) | 24·5 (22·8–26·2) | 30·2 (27·7–32·8) | 21·6 (20·3–22·9) | 19·7 (19·4–20·1) |
| Manufactured only, % | 48·2 (45·6–50·7) | 8·9 (8·3–9·6) | 27·5 (25·5–29·7) | 37·8 (35·8–39·9) | 44·9 (43·0–46·9) | 18·4 (17·3–19·6) | 58·1 (56·3–59·9) | 47·4 (45·4–49·4) | 32·7 (30·9–34·6) | 31·6 (30·4–32·9) | 43·1 (41·0–45·2) | 14·0 (13·4–14·7) | 24·0 (22·3–25·7) | 16·7 (14·7–19·0) | 13·3 (12·2–14·3) | NA* |
| Hand-rolled only, % | 1·6 (1·1–2·5) | 0·9 (0·7–1·1) | 0·0 | 0·6 (0·3–1·0) | 0·6 (0·4–1·0) | 15·8 (14·6–17·2) | 0·1 (0·0–0·3) | 0·2 (0·1–0·4) | 1·6 (1·2–2·1) | 0·1 (0·1–0·3) | 2·0 (1·4–2·8) | 3·6 (3·3–4·0) | 0·0 (0·0–0·0) | 5·9 (4·7–7·5) | 8·3 (7·5–9·1) | NA* |
| Both, % | 2·3 (1·5–3·5) | 0·7 (0·6–0·8) | 0·7 (0·4–1·3) | 1·3 (0·9–1·9) | 1·7 (1·2–2·3) | 11·2 (9·9–12·5) | 1·2 (0·8–1·7) | 2·1 (1·6–2·6) | 2·4 (1·8–3·3) | 0·1 (0·0–0·1) | 2·7 (2·1–3·4) | 3·7 (3·4–4·1) | 0·5 (0·3–0·8) | 7·5 (6·1–9·2) | NA* | NA* |
| Other smoking‡, % | 1·6 (1·0–2·4) | 17·1 (16·2–18·1) | 22·1 (19·9–24·5) | 13·1 (11·5–15·0) | 0·5 (0·2–0·9) | 0·3 (0·1–0·5) | 7·4 (6·3–8·7) | 3·9 (3·1–4·9) | 1·1 (0·8–1·6) | 6·3 (5·6–6·9) | 4·8 (3·8–6·0) | 0·7 (0·6–0·9) | 0·6 (0·3–1·1) | 1·6 (0·9–2·9) | 1·3 (1·0–1·6) | 6·9 (6·7–7·1) |
| Daily cigarette smoking, % | 44·6 (41·9–47·2) | 6·3 (5·8–6·9) | 24·5 (22·6–26·4) | 31·0 (29·0–33·1) | 38·0 (36·1–39·9) | 39·1 (37·4–40·9) | 54·7 (52·9–56·5) | 45·4 (43·5–47·4) | 33·5 (31·6–35·4) | 30·6 (29·3–31·8) | 43·8 (41·7–45·8) | 18·2 (17·5–19·0) | 11·7 (10·6–13·0) | 24·3 (21·9–26·8) | NA* | 15·7 (15·3–16·0) |
| Mean cigarettes per day§ | 16·6 (16·0–17·2) | 6·1 (5·8–6·5) | 8·7 (8·1–9·2) | 13·6 (12·7–14·5) | 11·3 (10·7–11·8) | 12·9 (12·5–13·3) | 18·5 (17·9–19·0) | 18·1 (17·6–18·7) | 18·3 (17·6–19·0) | 19·4 (18·7–20·1) | 19·3 (18·6–19·9) | 14·7 (14·2–15·1) | 9·7 (8·5–11·0) | 17·6 (16·4–18·8) | NA* | 18·2 (18·0–18·4) |
| Current smokeless tobacco use, % | 0·7 (0·4–1·2) | 32·9 (31·6–34·2) | 26·4 (24·2–28·6) | 0·3 (0·2–0·5) | 2·7 (2·1–3·6) | 1·3 (1·1–1·7) | 1·0 (0·7–1·6) | 0·5 (0·2–0·9) | 1·0 (0·7–1·5) | 4·1 (3·4–4·8) | NA* | 0·6 (0·5–0·8) | 0·3 (0·2–0·5) | 0·0 (0·0–0·1) | NA* | 3·5 (3·4–3·7) |
| Any current tobacco use, % | 52·9 (50·6–55·2) | 47·9 (46·7–49·1) | 58·0 (55·9–60·1) | 47·6 (45·6–49·6) | 49·2 (47·2–51·1) | 46·4 (44·6–48·2) | 60·6 (58·8–62·4) | 50·1 (48·2–52·1) | 37·3 (35·3–39·3) | 38·1 (36·8–39·4) | 47·9 (45·9–50·0) | 22·0 (21·3–22·8) | 25·0 (23·3–26·7) | 30·7 (28·2–33·4) | 22·8 (21·6–24·2) | 26·2 (25·8–26·6) |
| **Women (≥15 years)** | | | | | | | | | | | | | | | | |
| Sample size | 6751 | 35529 | 5161 | 5569 | 4961 | 10514 | 5189 | 4082 | 3973 | 10862 | 4761 | 21386 | 7457 | 2947 | 7935 | 98427 |
| Population estimate, millions | 524·3 (455·9–592·7) | 384·4 (368·3–400·5) | 48·0 (45·2–50·7) | 33·1 (32·1–34·0) | 30·7 (29·3–32·2) | 27·0 (26·3–27·8) | 61·4 (58·3–64·5) | 21·8 (21·1–22·5) | 16·9 (16·4–17·4) | 24·3 (23·0–25·7) | 26·1 (25·3–26·8) | 74·5 (70·9–78·0) | 36·0 (32·4–39·6) | 1·3 (1·2–1·4) | 22·4 (21·7–23·2) | 119·6 (119·5–119·8) |
| Current smoking, % | 2·4 (1·9–3·1) | 2·9 (2·6–3·4) | 1·5 (1·1–2·1) | 1·4 (1·0–2·1) | 9·0 (8·0–10·1) | 3·1 (2·7–3·6) | 21·7 (19·6–23·8) | 11·3 (10·0–12·7) | 24·4 (22·8–26·0) | 0·5 (0·3–0·8) | 15·2 (14·0–16·5) | 13·1 (12·6–13·7) | 7·8 (6·7–9·1) | 19·8 (18·1–21·6) | 20·6 (19·5–21·8) | 16·2 (15·9–16·5) |
| Daily smoking, % | 2·0 (1·5–2·6) | 2·4 (2·1–2·8) | 1·3 (0·9–1·9) | 1·2 (0·8–1·8) | 6·9 (6·0–7·8) | 2·4 (2·0–2·9) | 16·3 (14·5–18·2) | 8·9 (7·7–10·2) | 21·0 (19·6–22·5) | 0·5 (0·3–0·7) | 11·6 (10·5–12·8) | 11·5 (11·0–12·1) | 3·7 (3·0–4·6) | 16·4 (14·8–18·1) | NA* | 12·8 (12·6–13·1) |
| Cigarette smoking†, % | 2·3 (1·8–3·0) | 0·9 (0·7–1·1) | 0·2 (0·1–0·5) | 1·2 (0·8–1·8) | 8·8 (7·8–9·9) | 2·8 (2·4–3·3) | 21·4 (19·4–23·6) | 11·1 (9·8–12·5) | 24·2 (22·6–25·8) | 0·2 (0·1–0·4) | 15·1 (13·9–16·4) | 12·9 (12·3–13·4) | 7·5 (6·4–8·8) | 19·8 (18·1–21·6) | 20·6 (19·4–21·8) | 15·8 (15·5–16·1) |
| Manufactured only, % | 1·8 (1·3–2·4) | 0·1 (0·1–0·2) | 0·2 (0·1–0·4) | 0·8 (0·5–1·2) | 7·1 (6·2–8·2) | 1·0 (0·8–1·2) | 21·0 (19·0–23·2) | 10·9 (9·7–12·3) | 22·1 (20·6–23·6) | 0·2 (0·1–0·4) | 14·5 (13·3–15·7) | 9·8 (9·3–10·4) | 7·3 (6·3–8·6) | 16·5 (14·8–18·2) | 16·5 (15·5–17·5) | NA* |
| Hand-rolled only, % | 0·4 (0·2–0·6) | 0·3 (0·2–0·5) | 0·1 (0·0–0·3) | 0·2 (0·1–0·4) | 1·3 (0·9–1·8) | 1·7 (1·4–2·1) | 0·0 | 0·0 | 1·3 (0·8–1·9) | 0·0 | 0·2 (0·1–0·5) | 1·7 (1·5–2·0) | 0·0 (0·0–0·0) | 1·2 (0·7–1·9) | 4·1 (3·6–4·7) | NA* |
| Both, % | 0·2 (0·1–0·4) | 0·4 (0·3–0·6) | 0·0 | 0·2 (0·0–0·9) | 0·3 (0·2–0·6) | 0·1 (0·1–0·2) | 0·3 (0·1–0·6) | 0·1 (0·0–0·4) | 0·9 (0·6–1·3) | 0·0 (0·0–0·1) | 0·4 (0·3–0·7) | 1·3 (1·1–1·5) | 0·2 (0·1–0·3) | 2·1 (1·5–2·9) | NA* | NA* |

(Continues on next page)

| | China | India | Bangladesh | Vietnam | Philippines | Thailand | Russia | Ukraine | Poland | Egypt | Turkey | Brazil | Mexico | Uruguay | UK | USA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Continued from previous page) | | | | | | | | | | | | | | | | |
| Other smoking‡, % | 0·1 (0·0–0·4) | 2·4 (2·0–2·8) | 1·3 (0·9–1·9) | 0·2 (0·1–0·5) | 0·3 (0·2–0·5) | 0·3 (0·1–0·7) | 3·6 (2·7–4·8) | 1·3 (0·9–1·8) | 0·4 (0·2–0·7) | 0·3 (0·2–0·6) | 0·8 (0·5–1·3) | 0·7 (0·5–0·8) | 0·2 (0·1–0·4) | 0·2 (0·1–0·5) | 0·0 (0·0–0·1) | 0·8 (0·8–0·9) |
| Daily cigarette smoking, % | 1·9 (1·4–2·5) | 0·6 (0·4–0·8) | 0·2 (0·1–0·5) | 1·0 (0·6–1·5) | 6·7 (5·9–7·7) | 2·2 (1·9–2·6) | 16·3 (14·5–18·2) | 8·9 (7·7–10·2) | 20·9 (19·5–22·4) | 0·2 (0·1–0·3) | 11·6 (10·5–12·8) | 11·0 (10·5–11·5) | 3·7 (2·9–4·5) | 16·4 (14·8–18·1) | NA* | 12·7 (12·5–13·0) |
| Mean cigarettes per day§ | 12·8 (11·7–14·0) | 7·0 (5·5–8·5) | NA¶ | 10·9 (9·4–12·4) | 6·9 (6·1–7·8) | 8·6 (7·3–9·8) | 12·7 (11·8–13·5) | 11·8 (10·9–12·6) | 15·5 (14·9–16·1) | NA¶ | 12·2 (11·2–13·1) | 12·4 (12·0–12·9) | 8·4 (6·0–10·7) | 12·5 (11·5–13·5) | NA* | 15·2 (15·0–15·3) |
| Current smokeless tobacco use, % | 0·0 (0·0–0·1) | 18·4 (17·4–19·5) | 27·9 (25·9–30·0) | 2·3 (1·7–3·0) | 1·2 (0·8–1·6) | 6·3 (5·5–7·2) | 0·2 (0·1–0·4) | 0·0 (0·0–0·1) | 0·1 (0·0–0·3) | 0·3 (0·2–0·4) | NA* | 0·3 (0·2–0·4) | 0·3 (0·2–0·6) | 0·0 | NA* | 0·2 (0·2–0·2) |
| Any current tobacco use, % | 2·4 (1·9–3·1) | 20·3 (19·2–21·3) | 28·7 (26·7–30·8) | 3·6 (2·9–4·5) | 10·0 (8·9–11·1) | 9·1 (8·2–10·2) | 21·7 (19·7–23·9) | 11·3 (10·0–12·7) | 24·4 (22·8–26·0) | 0·6 (0·4–0·9) | 15·2 (14·0–16·5) | 13·3 (12·8–13·9) | 7·9 (6·8–9·2) | 19·8 (18·1–21·6) | 20·6 (19·5–21·8) | 16·3 (16·0–16·6) |
| **Overall (≥15 years)** | | | | | | | | | | | | | | | | |
| Sample size | 13 354 | 69 296 | 9629 | 9925 | 9701 | 20 566 | 11 406 | 8158 | 7840 | 20 924 | 9030 | 39 425 | 13 617 | 5581 | 14 630 | 174 265 |
| Population estimate, millions | 1068·8 (946·7–1190·8) | 795·5 (762·4–828·7) | 95·4 (90·4–100·4) | 64·3 (63·2–65·5) | 61·3 (58·6–63·9) | 52·6 (51·3–54·0) | 112·2 (106·9–117·6) | 40·0 (38·8–41·2) | 32·3 (31·8–32·9) | 49·7 (46·8–52·5) | 51·2 (49·8–52·5) | 143·0 (136·1–149·9) | 68·8 (61·9–75·6) | 2·5 (2·4–2·5) | 41·9 (40·6–43·3) | 231·6 (231·4–231·7) |
| Current smoking, % | 28·1 (26·7–29·7) | 14·0 (13·4–14·6) | 23·0 (21·9–24·2) | 23·8 (22·7–24·9) | 28·2 (27·0–29·5) | 23·7 (22·8–24·7) | 39·1 (37·8–40·5) | 28·9 (27·7–30·1) | 30·3 (29·0–31·7) | 19·4 (18·8–20·1) | 31·2 (30·0–32·6) | 17·2 (16·7–17·7) | 15·9 (14·8–17·1) | 25·0 (23·3–26·6) | 21·7 (20·7–22·7) | 19·9 (19·7–20·2) |
| Daily smoking, % | 24·1 (22·6–25·7) | 10·7 (10·2–11·2) | 20·9 (19·8–22·0) | 19·5 (18·4–20·5) | 22·5 (21·4–23·7) | 20·3 (19·4–21·2) | 33·8 (32·5–35·1) | 25·5 (24·4–26·7) | 27·0 (25·8–28·2) | 18·5 (17·8–19·2) | 27·4 (26·2–28·7) | 15·1 (14·6–15·5) | 7·6 (6·8–8·3) | 20·4 (19·1–21·8) | NA* | 14·6 (14·4–14·8) |
| Cigarette smoking†, % | 27·7 (26·2–29·2) | 5·8 (5·5–6·2) | 14·2 (13·2–15·2) | 19·9 (18·7–21·1) | 27·9 (26·8–29·2) | 23·5 (22·6–24·5) | 38·8 (37·4–40·2) | 28·6 (27·5–29·8) | 30·2 (28·8–31·5) | 16·3 (15·7–17·0) | 31·1 (29·9–32·5) | 16·9 (16·5–17·4) | 15·6 (14·5–16·8) | 24·7 (23·1–26·4) | 21·0 (20·1–22·0) | 17·7 (17·5–17·9) |
| Manufactured only, % | 25·4 (23·9–27·0) | 4·7 (4·4–5·0) | 13·8 (12·8–14·8) | 18·8 (17·7–19·9) | 26·0 (24·8–27·2) | 9·5 (8·9–10·1) | 37·8 (36·5–39·2) | 27·5 (26·3–28·7) | 27·1 (25·9–28·4) | 16·2 (15·6–16·9) | 28·5 (27·3–29·8) | 11·8 (11·4–12·3) | 15·3 (14·1–16·5) | 16·6 (15·2–18·1) | 15·0 (14·2–15·8) | NA* |
| Hand-rolled only, % | 1·0 (0·7–1·5) | 0·6 (0·5–0·8) | 0·0 (0·0–0·2) | 0·4 (0·3–0·6) | 0·9 (0·7–1·3) | 8·6 (7·9–9·3) | 0·0 (0·0–0·1) | 0·1 (0·1–0·2) | 1·4 (1·1–1·8) | 0·1 (0·0–0·1) | 1·1 (0·7–1·5) | 2·6 (2·4–2·9) | 0·0 (0·0–0·0) | 3·4 (2·8–4·3) | 6·0 (5·5–6·6) | NA* |
| Both, % | 1·3 (0·8–1·9) | 0·5 (0·5–0·7) | 0·4 (0·2–0·6) | 0·7 (0·5–1·2) | 1·0 (0·7–1·3) | 5·5 (4·9–6·2) | 0·7 (0·5–1·0) | 1·0 (0·8–1·3) | 1·6 (1·2–2·1) | 0·0 (0·0–0·1) | 1·5 (1·2–1·9) | 2·5 (2·2–2·7) | 0·3 (0·2–0·5) | 4·7 (3·9–5·7) | NA* | NA* |
| Other smoking‡, % | 0·9 (0·6–1·3) | 10·0 (9·5–10·6) | 11·7 (10·5–12·9) | 6·5 (5·7–7·4) | 0·4 (0·2–0·6) | 0·3 (0·1–0·5) | 5·3 (4·4–6·4) | 2·5 (2·0–3·0) | 0·7 (0·5–1·0) | 3·3 (3·0–3·7) | 2·8 (2·2–3·5) | 0·7 (0·6–0·8) | 0·4 (0·2–0·6) | 0·9 (0·5–1·5) | 0·6 (0·5–0·8) | 3·8 (3·6–3·9) |
| Daily cigarette smoking, % | 23·6 (22·1–25·2) | 3·5 (3·3–3·9) | 12·3 (11·4–13·2) | 15·6 (14·5–16·7) | 22·3 (21·2–23·4) | 20·1 (19·2–21·0) | 33·7 (32·4–35·0) | 25·5 (24·3–26·6) | 26·9 (25·7–28·2) | 15·7 (15·0–16·3) | 27·4 (26·2–28·6) | 14·5 (14·0–14·9) | 7·5 (6·8–8·3) | 20·1 (18·8–21·5) | NA* | 14·1 (13·9–14·4) |
| Mean cigarettes per day§ | 16·1 (15·6–16·7) | 2·1 (1·9–2·3) | 5·1 (4·6–5·6) | 10·9 (10·0–11·7) | 10·5 (10·0–11·0) | 12·5 (12·1–12·9) | 16·9 (16·4–17·4) | 16·9 (16·4–17·4) | 17·1 (16·6–17·6) | 16·4 (15·7–17·1) | 17·7 (17·1–18·3) | 13·3 (12·9–13·6) | 9·3 (8·1–10·6) | 15·2 (14·3–16·1) | NA* | 16·8 (16·6–16·9) |
| Current smokeless tobacco use, % | 0·4 (0·2–0·7) | 25·9 (24·9–26·9) | 27·2 (25·5–28·9) | 1·3 (1·0–1·7) | 1·9 (1·5–2·5) | 3·9 (3·4–4·4) | 0·6 (0·4–0·9) | 0·2 (0·1–0·4) | 0·5 (0·4–0·8) | 2·2 (1·9–2·6) | 0·0 | 0·4 (0·4–0·5) | 0·3 (0·2–0·5) | 0·0 (0·0–0·0) | NA* | 1·8 (1·7–1·9) |
| Any current tobacco use, % | 28·1 (26·7–29·7) | 34·6 (33·6–35·5) | 43·3 (41·7–45·0) | 25·0 (23·8–26·2) | 29·5 (28·3–30·8) | 27·2 (26·2–28·3) | 39·3 (38·0–40·8) | 28·9 (27·8–30·1) | 30·5 (29·2–31·9) | 19·7 (19·0–20·4) | 31·2 (30·0–32·6) | 17·5 (17·0–18·0) | 16·0 (14·9–17·3) | 25·0 (23·3–26·6) | 21·7 (20·7–22·7) | 21·1 (20·9–21·3) |

Data are n, n (95% CI), or % (95% CI). Apart from the mean number of cigarettes smoked per day, estimates are among all men, all women, or the total population (as relevant) in each country. Definitions for these indicators differ in the General Lifestyle Survey (UK)[10] and the Tobacco Use Supplement to the Current Population Survey (USA)[11] compared with those used in the 14 GATS countries. See Methods and appendix for details. Data from the 2008–10 GATS,[8,9] 2008 General Lifestyle Survey (UK),[10] and the 2006–07 Tobacco Use Supplement to the Current Population Survey (USA).[11] NA=not available. GATS=Global Adult Tobacco Survey. *Country did not collect data for this variable. †Cigarette smoking includes manufactured and hand-rolled cigarettes, but not bidis; estimates for Brazil and Philippines include kreteks; cigarette smoking estimate in Russia includes cardboard tube-tipped cigarettes (papirosy). ‡Eg, bidi, shisha, cigar, or pipe. §Among daily cigarette smokers. ¶Estimate not reported because sample size was <25 individuals.

***Table 1:*** **Patterns of tobacco use, by sex, in the UK, USA, and 14 GATS countries**

### Statistical analysis

The surveys in this study used complex sample designs that involved clustering of households.[8–11] We calculated sampling weights to account for differential probabilities of selection and participation. We calculated all point estimates and 95% CIs from weighted data with SPSS version 18.0, which estimated variances while accounting for the clustered sample designs. Estimates for eight indicators were also age-standardised via the direct method, and assuming the WHO world standard population (aged ≥15 years).[12] Estimates based on a sample size of fewer than 25 individuals were not reported due to instability. We used Pearson product moment correlations to compare the mean number of cigarettes smoked each day with daily cigarette smoking prevalence across countries.

### Role of the funding source

Bloomberg Philanthropies collaborated with the GATS Collaborative Group (see appendix p 1) on the design of GATS samples and questionnaires. Study sponsors had no role in study design, data collection, data analysis, or data interpretation. Bloomberg Philanthropies made comments on a previous draft of the report. GAG had final decision authority on the content of the report. GAG and SAM had full access to GATS and Tobacco Use Supplement data. MJ had full access to the General Lifestyle Survey data. All authors share final responsibility for the decision to submit for publication.

## Results

Table 1 shows sex-specific and country-specific patterns of tobacco use, and sample sizes are shown in appendix p 6. Prevalence of smoking any tobacco product was generally much higher for men than women in every GATS country (figure, appendix p 7). In men, the prevalence of current smoking ranged from 21·6% (95% CI 20·8–22·4) in Brazil to 60·2% (58·4–62·0) in Russia. In women, current smoking prevalence ranged from 0·5% (0·3–0·8) in Egypt to 24·4% (22·8–26·0) in Poland. In the UK, about the same proportion of men (22·8%, 21·6–24·2) and women (20·6%, 19·5–21·8) smoked; in the USA, men were more likely to smoke (24·0%, 23·6–24·3) than were women (16·2%, 15·9–16·5). For GATS countries, the male:female prevalence ratio for smoking was highest in Egypt (75) and Asian countries such as Vietnam (33) and China (22) and was lowest in Poland (1·5) and Uruguay (1·6).

In GATS countries, most current smokers were daily smokers (75·0–95·2%), apart from in Mexico, where

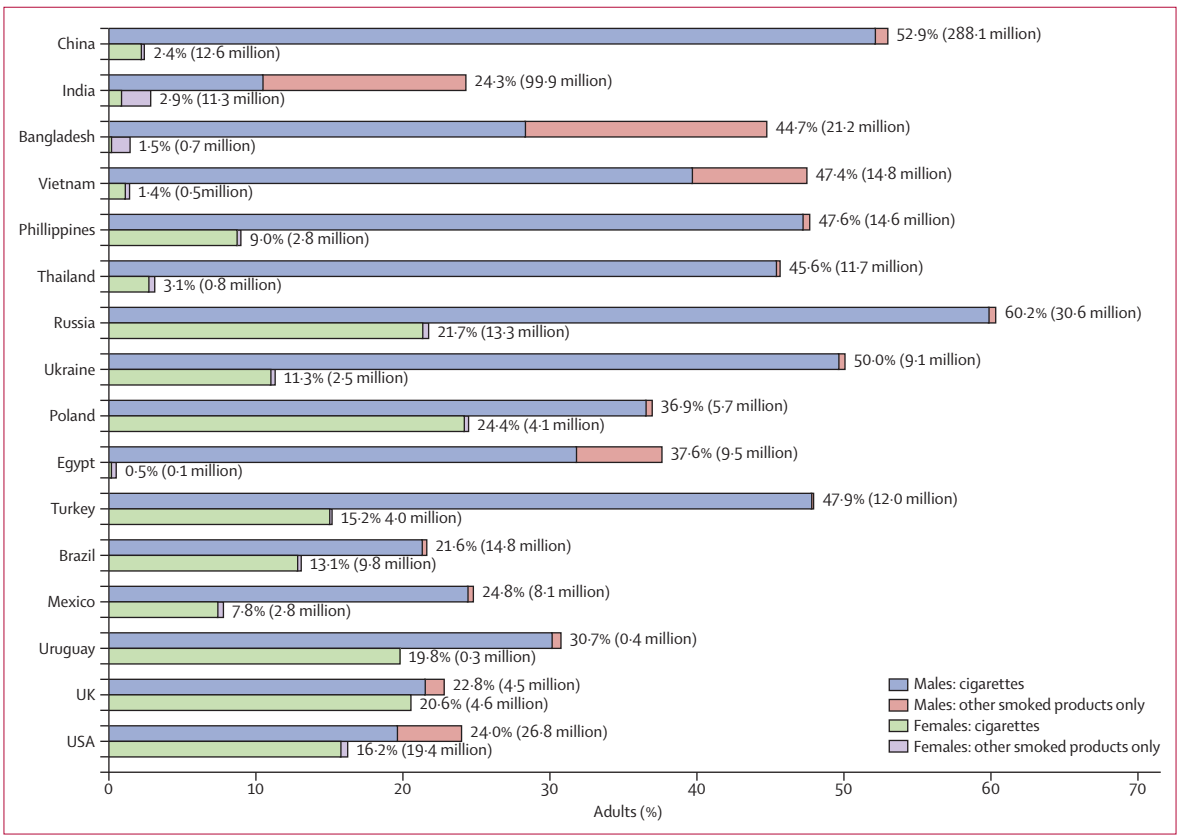


*Figure:* **Proportion of adults ages 15 years or older who currently smoke cigarettes and other tobacco products and number of current tobacco smokers (in millions), by sex, for the UK, USA, and 14 GATS countries**
GATS=Global Adult Tobacco Survey.

fewer than half smoked every day (appendix pp 8–9). With the exception of India, most smokers smoked cigarettes, particularly manufactured cigarettes (figure, appendix pp 9–10). For men, smoking of bidis was common in Bangladesh (21·4%, 95% CI 19·2–23·7) and India (16·1%, 15·2–17·0), whereas use of waterpipes was relatively high in Vietnam (13·0%, 11·4–14·9), Egypt (6·2%, 5·6–6·9), Russia (4·4%, 3·6–5·5), Turkey (4·0%, 3·0–5·1), and Ukraine (3·2%, 2·4–4·1; appendix p 11). For women in Russia, use of waterpipes was 3·2% (2·4–4·3).

Intensity of smoking in male daily cigarette smokers ranged from 6·1 cigarettes per day (95% CI 5·8–6·5) in

| | China | India | Bangladesh | Vietnam | Philippines | Thailand | Russia | Ukraine | Poland | Egypt | Turkey | Brazil | Mexico | Uruguay | UK | USA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Men (≥15 years)** | | | | | | | | | | | | | | | | |
| Sample size | 6603 | 33767 | 4468 | 4356 | 4740 | 10052 | 6217 | 4076 | 3867 | 10062 | 4269 | 18039 | 6160 | 2634 | 6695 | 75838 |
| Population estimate, millions | 544·5 (484·3–604·6) | 411·1 (393·6–428·7) | 47·4 (44·9–50·0) | 31·3 (30·2–32·3) | 30·6 (29·2–31·9) | 25·6 (24·8–26·3) | 50·8 (48·4–53·3) | 18·2 (17·6–18·7) | 15·4 (14·9–16·0) | 25·3 (23·7–26·9) | 25·1 (24·3–25·9) | 68·5 (65·2–71·8) | 32·8 (29·4–36·2) | 1·2 (1·1–1·2) | 19·5 (18·8–20·2) | 111·9 (111·8–112·1) |
| Age (years) | | | | | | | | | | | | | | | | |
| 15–24 | 33·6 (28·0–39·6) | 9·7 (8·5–11·0) | 24·0 (20·4–28·0) | 26·1 (22·4–30·2) | 38·5 (34·8–42·3) | 37·4 (32·5–42·6) | 52·5 (48·6–56·4) | 45·1 (40·0–50·4) | 28·4 (23·6–33·7) | 21·7 (19·3–24·3) | 39·6 (34·7–44·7) | 14·8 (13·5–16·2) | 26·7 (23·6–30·1) | 28·9 (23·4–35·0) | 24·2 (20·4–28·4) | 20·7 (19·8–21·7) |
| 25–34 | 53·0 (48·0–57·9) | 22·4 (20·7–24·3) | 48·8 (44·4–53·2) | 52·9 (48·8–56·9) | 58·0 (54·0–61·9) | 49·8 (46·2–53·4) | 69·2 (65·5–72·7) | 60·7 (56·4–64·9) | 42·6 (38·7–46·7) | 44·0 (41·5–46·6) | 58·2 (54·1–62·1) | 20·2 (18·8–21·7) | 28·0 (25·0–31·1) | 39·8 (33·6–46·3) | 30·4 (26·8–34·4) | 28·7 (27·8–29·5) |
| 35–44 | 63·7 (59·5–67·6) | 32·0 (30·1–33·9) | 57·9 (54·1–61·7) | 59·9 (56·1–63·6) | 52·9 (49·3–56·5) | 52·7 (49·6–55·9) | 67·2 (63·0–71·2) | 60·2 (55·6–64·7) | 41·5 (37·3–45·8) | 47·9 (45·3–50·5) | 58·2 (54·3–62·1) | 25·1 (23·4–26·8) | 24·9 (21·9–28·2) | 29·2 (24·1–34·8) | 25·2 (22·4–28·2) | 26·4 (25·6–27·2) |
| 45–54 | 66·3 (62·8–69·7) | 38·4 (36·0–40·8) | 61·6 (56·3–66·6) | 61·5 (57·3–65·6) | 48·4 (43·7–53·1) | 46·4 (43·5–49·4) | 65·1 (61·5–68·6) | 57·4 (53·1–61·5) | 47·7 (43·2–52·3) | 50·0 (46·9–53·1) | 50·6 (46·3–54·9) | 29·0 (27·1–31·1) | 25·1 (21·4–29·3) | 38·4 (32·1–45·1) | 25·5 (22·8–28·5) | 28·5 (27·6–29·4) |
| 55–64 | 58·9 (53·8–63·8) | 36·0 (33·2–38·9) | 52·6 (45·9–59·2) | 55·7 (50·0–61·4) | 46·2 (40·5–52·0) | 43·6 (40·1–47·1) | 58·2 (53·9–62·4) | 43·4 (38·6–48·3) | 35·0 (30·4–39·9) | 45·1 (41·5–48·8) | 39·9 (34·9–45·2) | 26·6 (24·2–29·2) | 20·6 (16·9–24·8) | 30·0 (23·6–37·3) | 22·3 (20·0–24·8) | 23·9 (23·1–24·8) |
| ≥65 | 40·2 (35·8–44·9) | 31·0 (28·3–33·8) | 39·1 (32·7–45·9) | 33·3 (28·5–38·4) | 36·6 (30·5–43·1) | 37·7 (34·2–41·4) | 40·7 (35·6–46·1) | 25·3 (21·8–29·1) | 20·4 (16·3–25·3) | 34·9 (30·7–39·5) | 20·5 (16·8–24·8) | 17·3 (15·4–19·3) | 13·1 (10·7–15·9) | 13·2 (9·8–17·5) | 12·6 (10·9–14·4) | 12·6 (12·0–13·3) |
| **Women (≥15 years)** | | | | | | | | | | | | | | | | |
| Sample size | 6751 | 35529 | 5161 | 5569 | 4961 | 10514 | 5189 | 4082 | 3973 | 10862 | 4761 | 21386 | 7457 | 2947 | 7935 | 98427 |
| Population estimate, millions | 524·3 (455·9–592·7) | 384·4 (368·3–400·5) | 48·0 (45·2–50·7) | 33·1 (32·1–34·0) | 30·7 (29·3–32·2) | 27·0 (26·3–27·8) | 61·4 (58·3–64·5) | 21·8 (21·1–22·5) | 16·9 (16·4–17·4) | 24·3 (23·0–25·7) | 26·1 (25·3–26·8) | 74·5 (70·9–78·0) | 36·0 (32·4–39·6) | 1·3 (1·2–1·4) | 22·4 (21·7–23·2) | 119·6 (119·5–119·8) |
| Age (years) | | | | | | | | | | | | | | | | |
| 15–24 | 0·7 (0·2–1·9) | 0·3 (0·2–0·6) | 0·4 (0·1–1·0) | 0·3 (0·0–1·4) | 3·0 (2·0–4·7) | 1·4 (0·9–2·3) | 32·6 (27·7–38·0) | 15·4 (11·1–20·8) | 20·2 (16·3–24·7) | 0·2 (0·1–0·6) | 11·6 (9·1–14·6) | 6·4 (5·6–7·4) | 7·5 (5·8–9·6) | 20·2 (15·6–25·8) | 28·8 (24·8–33·2) | 15·0 (14·2–15·7) |
| 25–34 | 0·3 (0·1–0·7) | 1·3 (0·9–1·8) | 0·7 (0·3–1·7) | 0·4 (0·2–1·0) | 6·7 (5·0–8·9) | 1·5 (1·0–2·1) | 32·1 (28·1–36·4) | 23·4 (19·4–28·0) | 25·4 (21·9–29·2) | 0·2 (0·1–0·5) | 22·6 (20·0–25·4) | 12·6 (11·6–13·8) | 8·9 (7·1–11·0) | 29·3 (24·5–34·7) | 25·3 (22·4–28·5) | 19·1 (18·3–19·8) |
| 35–44 | 2·4 (1·4–3·9) | 3·2 (2·5–4·0) | 1·5 (0·7–3·2) | 1·4 (0·7–2·8) | 8·7 (6·8–11·2) | 3·0 (2·1–4·1) | 30·6 (25·9–35·7) | 16·4 (13·0–20·6) | 30·9 (26·8–35·4) | 0·6 (0·4–1·2) | 20·1 (17·1–23·5) | 16·5 (15·1–17·9) | 7·7 (5·9–9·9) | 22·6 (18·3–27·7) | 23·7 (21·3–26·2) | 19·4 (18·7–20·1) |
| 45–54 | 3·5 (2·5–4·8) | 4·3 (3·4–5·4) | 1·5 (0·8–2·9) | 2·8 (1·8–4·1) | 15·3 (12·1–19·1) | 4·0 (3·1–5·2) | 22·1 (18·2–26·6) | 11·2 (8·5–14·6) | 38·1 (33·6–42·8) | 1·2 (0·6–2·3) | 14·7 (11·8–18·2) | 19·9 (18·2–21·6) | 10·7 (8·4–13·5) | 26·1 (20·4–32·7) | 22·2 (19·7–24·9) | 20·2 (19·5–20·9) |
| 55–64 | 2·8 (1·8–4·4) | 7·7 (5·7–10·4) | 4·6 (2·7–7·6) | 3·1 (1·7–5·4) | 15·1 (11·1–20·1) | 4·9 (3·7–6·6) | 12·6 (9·7–16·2) | 3·7 (2·3–6·0) | 28·5 (24·4–32·9) | 0·7 (0·3–1·7) | 10·7 (7·7–14·7) | 15·0 (13·3–16·9) | 6·0 (3·8–9·3) | 19·4 (14·8–25·1) | 17·6 (15·6–19·7) | 15·5 (14·9–16·1) |
| ≥65 | 6·7 (4·8–9·2) | 9·9 (7·9–12·4) | 6·6 (3·5–12·2) | 3·0 (1·6–5·4) | 21·0 (16·3–26·7) | 5·6 (4·2–7·4) | 2·9 (1·7–4·9) | 0·0 | 6·6 (4·6–9·6) | 1·4 (0·7–3·1) | 2·4 (1·3–4·3) | 9·3 (8·1–10·7) | 3·0 (1·8–5·0) | 5·2 (3·8–7·1) | 11·4 (10·0–13·0) | 7·4 (7·0–7·9) |

Data are n, n (95% CI) or % (95% CI). GATS=Global Adult Tobacco Survey. In GATS, current smokers are individuals who smoke tobacco daily or less than daily. In the General Lifestyle Survey, current smokers are men who smoke cigarettes, cigars, or pipes and women who smoke cigarettes or cigars. In the Tobacco Use Supplement to the Current Population Survey, current smokers include individuals who have ever smoked at least 100 cigarettes in their lifetimes and who smoke cigarettes every day or on some days, and individuals who smoke cigars or pipes on every day or on some days. Data from the 2008–10 GATS,[8,9] 2008 General Lifestyle Survey (UK),[10] and the 2006–07 Tobacco Use Supplement to the Current Population Survey (USA).[11]

***Table 2:*** **Current smoking prevalence (%), by sex and age, in the UK, USA, and 14 GATS countries**

India to 19·4 cigarettes per day (18·7–20·1) in Egypt (table 1, appendix p 12). In female daily cigarette smokers, the range was 6·9 cigarettes per day (6·1–7·8) in the Philippines to 15·5 cigarettes per day (14·9–16·1) in Poland. Among all countries, the mean number of cigarettes smoked each day was directly correlated with the prevalence of daily cigarette smoking ($r$=0·672 and p=0·009 in men; $r$=0·714 and p=0·009 in women).

In most countries, prevalence estimates for any current tobacco use were much the same as those for current smoking. However, these two estimates differed in India and Bangladesh, where the use of smokeless tobacco was common (table 1, appendix p 13). In men, prevalence of tobacco use was highest in Russia at 60·6% (58·8–62·4) and second highest in Bangladesh at 58·0% (55·9–60·1); in women, prevalence of tobacco use in Bangladesh

| | China | India | Bangladesh | Vietnam | Philippines | Thailand | Russia | Ukraine | Poland | Egypt | Turkey | Brazil | Mexico | Uruguay | UK* | USA† |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Men** | | | | | | | | | | | | | | | | |
| Ever smokers (≥15 years) | 62·8 (60·4–65·1) | 29·3 (28·2–30·4) | 55·5 (53·2–57·8) | 66·5 (64·5–68·5) | 64·4 (62·3–66·4) | 67·7 (65·8–69·6) | 78·3 (76·8–79·8) | 73·1 (71·4–74·8) | 63·4 (61·5–65·4) | 46·1 (44·6–47·6) | 70·0 (68·1–71·9) | 43·0 (42·1–43·9) | 45·9 (43·9–47·9) | 58·5 (55·9–61·1) | 63·2 (61·7–64·7) | NA‡ |
| Ever daily smokers (≥15 years) | 52·2 (49·5–54·9) | 21·1 (20·1–22·1) | 49·1 (46·9–51·3) | 51·4 (49·5–53·4) | 49·3 (47·3–51·3) | 56·0 (54·0–57·9) | 68·3 (66·5–70·0) | 62·4 (60·4–64·3) | 55·4 (53·3–57·4) | 43·1 (41·7–44·6) | 61·0 (59·0–63·0) | 36·1 (35·3–37·0) | 19·4 (18·0–20·9) | 45·3 (42·8–47·9) | 51·4 (49·9–52·8) | 41·6 (41·2–42·0) |
| Mean age of initiation by age group, years | | | | | | | | | | | | | | | | |
| 25–34 | 20·2 (19·6–20·8) | 18·8 (18·4–19·3) | 17·9 (17·5–18·3) | 19·4 (19·0–19·9) | 17·9 (17·5–18·3) | 18·0 (17·7–18·4) | 17·0 (16·7–17·3) | 17·1 (16·8–17·5) | 17·7 (17·4–18·0) | 17·6 (17·4–17·9) | 17·0 (16·6–17·3) | 17·3 (17·0–17·5) | 16·7 (16·0–17·4) | 16·3 (15·8–16·8) | 16·4 (16·0–16·8) | 17·2 (17·1–17·3) |
| 35–44 | 20·6 (20·3–20·9) | 21·1 (20·6–21·5) | 19·0 (18·4–19·7) | 19·4 (19·0–19·8) | 18·2 (17·8–18·6) | 18·7 (18·3–19·0) | 17·8 (17·5–18·1) | 17·7 (17·3–18·1) | 18·5 (18·2–18·8) | 18·4 (18·1–18·8) | 16·6 (16·2–17·0) | 17·5 (17·3–17·8) | 17·1 (16·5–17·8) | 17·4 (16·8–18·1) | 17·1 (16·7–17·5) | 17·7 (17·5–17·8) |
| 45–54 | 21·7 (21·2–22·3) | 22·1 (21·6–22·6) | 19·1 (18·5–19·8) | 20·3 (19·7–20·9) | 19·1 (18·5–19·6) | 18·6 (18·3–18·9) | 17·9 (17·6–18·3) | 18·3 (17·9–18·6) | 18·6 (18·1–19·2) | 18·9 (18·4–19·4) | 17·4 (16·8–17·9) | 17·5 (17·2–17·9) | 17·1 (16·3–17·8) | 17·3 (16·6–18·0) | 16·9 (16·3–17·5) | 17·6 (17·5–17·7) |
| 55–64 | 22·3 (21·6–22·9) | 23·4 (22·3–24·6) | 18·7 (17·9–19·5) | 20·7 (20·0–21·4) | 18·1 (17·3–19·0) | 18·4 (18·0–18·9) | 18·2 (17·6–18·8) | 18·2 (17·7–18·7) | 18·3 (17·8–18·7) | 19·1 (18·6–19·7) | 18·1 (17·4–18·8) | 17·8 (17·3–18·2) | 18·5 (17·2–19·7) | 17·0 (16·1–17·9) | 16·3 (15·9–16·6) | 17·4 (17·2–17·5) |
| ≥65 | 23·9 (23·0–24·9) | 23·7 (22·8–24·7) | 19·9 (17·9–21·9) | 22·9 (21·3–24·4) | 19·7 (18·3–21·0) | 19·3 (18·7–19·9) | 18·1 (17·4–18·7) | 16·8 (16·1–17·5) | 19·0 (18·5–19·4) | 19·3 (18·5–20·2) | 19·6 (18·5–20·8) | 17·2 (16·7–17·7) | 17·8 (16·5–19·0) | 17·3 (16·4–18·1) | 16·9 (16·5–17·2) | 17·3 (17·2–17·5) |
| **Women** | | | | | | | | | | | | | | | | |
| Ever smokers (≥15 years) | 3·1 (2·5–3·9) | 3·7 (3·2–4·2) | 2·7 (2·0–3·6) | 2·5 (1·9–3·2) | 14·8 (13·6–16·1) | 5·6 (5·0–6·4) | 31·9 (29·5–34·6) | 19·8 (18·1–21·5) | 41·5 (39·5–43·5) | 0·7 (0·5–1·0) | 25·2 (23·5–26·9) | 28·3 (27·6–29·1) | 16·6 (15·1–18·3) | 40·2 (38·0–42·5) | 52·0 (50·6–53·5) | NA‡ |
| Ever daily smokers (≥15 years) | 2·4 (1·9–3·1) | 3·0 (2·6–3·4) | 2·3 (1·7–3·2) | 1·7 (1·3–2·4) | 9·4 (8·4–10·4) | 3·8 (3·3–4·4) | 20·0 (18·0–22·2) | 12·1 (10·7–13·6) | 32·3 (30·6–34·1) | 0·6 (0·4–0·9) | 15·7 (14·4–17·0) | 22·7 (22·0–23·4) | 6·1 (5·3–7·1) | 29·1 (27·2–31·2) | 42·3 (40·9–43·7) | 32·2 (31·9–32·6) |
| Mean age of initiation by age group, years | | | | | | | | | | | | | | | | |
| 25–34 | NA§ | 17·5 (15·7–19·4) | NA§ | NA§ | 20·1 (18·7–21·5) | 19·1 (18·2–20·0) | 17·5 (17·1–18·0) | 19·0 (18·4–19·6) | 18·2 (17·8–18·6) | NA§ | 18·2 (17·6–18·7) | 17·6 (17·2–17·9) | 17·9 (17·0–18·7) | 17·1 (16·5–17·7) | 16·1 (15·8–16·4) | 17·2 (17·1–17·3) |
| 35–44 | 26·5 (24·4–28·5) | 23·3 (21·3–25·3) | NA§ | NA§ | 26·0 (23·9–28·1) | 20·8 (19·1–22·5) | 20·7 (19·9–21·6) | 21·3 (20·4–22·2) | 19·6 (19·0–20·2) | NA§ | 19·5 (18·7–20·4) | 18·2 (17·7–18·6) | 20·6 (18·9–22·3) | 18·4 (17·5–19·2) | 16·5 (16·1–16·9) | 17·6 (17·4–17·7) |
| 45–54 | 27·8 (24·1–31·5) | 27·6 (24·7–30·5) | NA§ | 25·9 (22·4–29·4) | 26·4 (24·2–28·6) | 24·0 (21·3–26·6) | 23·0 (21·5–24·6) | 26·7 (24·5–28·9) | 20·5 (20·0–21·0) | NA§ | 20·5 (19·5–21·5) | 18·6 (18·2–19·1) | 21·4 (19·7–23·1) | 18·5 (17·6–19·4) | 17·3 (16·7–18·0) | 18·2 (18·1–18·3) |
| 55–64 | 25·6 (21·9–29·3) | 28·2 (24·6–31·9) | 24·2 (18·6–29·8) | NA§ | 25·7 (22·5–28·9) | 25·6 (23·2–28·0) | 24·1 (21·9–26·2) | 29·0 (25·6–32·3) | 20·7 (20·1–21·4) | NA§ | 26·3 (23·8–28·9) | 20·2 (19·5–20·9) | 23·7 (21·7–25·6) | 20·3 (18·0–22·7) | 17·6 (17·1–18·1) | 19·2 (19·0–19·3) |
| ≥65 | 30·4 (26·3–34·5) | 30·2 (26·9–33·5) | 30·1 (18·1–42·0) | 23·2 (18·3–28·2) | 27·1 (24·2–30·0) | 23·4 (21·1–25·7) | 23·3 (19·0–27·7) | NA§ | 25·5 (22·1–28·9) | NA§ | 31·2 (25·9–36·4) | 20·8 (19·9–21·8) | 22·5 (19·4–25·6) | 24·3 (22·6–26·1) | 20·7 (19·5–21·9) | 20·2 (20·0–20·3) |

Data are % (95% CI) or n (95% CI). Data from the 2008–10 GATS,[8,9] 2008 General Lifestyle Survey (UK),[10] and the 2006–07 Tobacco Use Supplement to the Current Population Survey (USA).[11] Estimates for individuals aged 15–24 years are not included here because daily smoking rates have not stabilised by this age. NA=not available. GATS=Global Adult Tobacco Survey. *UK study[10] measured ever regular (not daily) smoking of cigarettes, cigars, or pipes and age of initiation of regular cigarette smoking. †US study[11] measured ever having smoked at least 100 lifetime cigarettes and age of initiation of regular cigarette smoking. See methods and appendix for details. ‡Country did not collect data for this variable. §Estimate not reported because sample size was <25 individuals.

***Table 3*: Prevalence of ever smoking and mean age of initiation of daily smoking among ever daily smokers, by sex and age in the UK, USA, and 14 GATS countries, and similar estimates for ever regular smokers in the UK and USA**

(28·7%, 26·7–30·8) exceeded that noted in Poland (24·4%, 22·8–26·0; table 1, appendix p 14). The percentage of men who used both smoked and smokeless tobacco products was highest in Bangladesh (13·0%, 11·6–14·6), India (9·3%, 8·7–9·9), and Egypt (3·6%, 3·0–4·3; appendix p 15).

Weighted estimates of the number of individuals who smoked or used various tobacco products in each country are presented in appendix pp 16–21. In the 14 GATS countries, UK, and USA, we estimated that there were 852 million tobacco users, made up of 661 million

| | China | India | Bangladesh | Vietnam | Philippines | Thailand | Russia | Ukraine | Poland | Egypt | Turkey | Brazil | Mexico | Uruguay | UK | USA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Men (≥15 years)** | | | | | | | | | | | | | | | | |
| Sample size | 4048 | 9748 | 2457 | 2594 | 2656 | 6207 | 4497 | 2759 | 2282 | 4884 | 2854 | 6938 | 1424 | 1345 | 3658 | 34 973 |
| Population estimate (ever daily smokers), millions | 297·0 (264·2–329·9) | 92·5 (86·9–98·0) | 24·1 (22·5–25·6) | 17·0 (16·2–17·8) | 16·2 (15·4–17·0) | 15·1 (14·5–15·6) | 36·0 (34·1–37·9) | 11·7 (11·3–12·2) | 8·8 (8·4–9·2) | 11·1 (10·4–11·8) | 15·8 (15·2–16·5) | 25·5 (24·2–26·7) | 7·9 (6·8–8·9) | 0·6 (0·5–0·6) | 10·4 (9·9–10·8) | 46·7 (46·2–47·1) |
| Former smoking in ever daily smokers, % | 12·6 (10·8–14·6) | 12·1 (10·9–13·5) | 16·6 (14·5–19·1) | 23·3 (21·2–25·5) | 20·9 (19·0–22·8) | 28·4 (26·6–30·4) | 18·8 (17·2–20·5) | 26·1 (24·2–28·1) | 38·3 (35·7–41·1) | 16·5 (15·1–18·0) | 27·2 (25·3–29·2) | 46·4 (44·9–47·8) | 31·6 (28·3–35·0) | 42·8 (39·1–46·5) | 57·1 (55·1–59·0) | 48·7 (48·1–49·2) |
| Age (years) | | | | | | | | | | | | | | | | |
| 15–24 | 2·4 (0·9–6·4) | 7·4 (4·4–12·4) | 7·6 (3·2–16·7) | 6·5 (3·0–13·4) | 5·5 (3·4–8·9) | 5·7 (3·2–10·0) | 7·8 (5·0–11·8) | 15·5 (10·8–21·7) | 13·6 (8·4–21·2) | 7·9 (5·2–11·6) | 6·6 (3·4–12·4) | 14·0 (11·1–17·6) | 8·5 (4·7–14·9) | 13·1 (6·7–24·0) | 20·9 (14·9–28·7) | 19·4 (17·4–21·5) |
| 25–34 | 3·3 (1·7–6·1) | 5·8 (4·3–7·9) | 8·7 (4·8–15·3) | 14·5 (11·0–18·9) | 7·5 (5·5–10·1) | 17·2 (13·8–21·3) | 10·6 (8·4–13·3) | 15·6 (12·3–19·6) | 25·8 (21·1–31·3) | 10·0 (8·1–12·4) | 17·1 (13·9–20·9) | 28·2 (25·0–31·6) | 23·4 (17·0–31·3) | 23·8 (17·4–31·7) | 35·0 (29·7–40·7) | 32·0 (30·5–33·6) |
| 35–44 | 8·4 (5·6–12·3) | 7·5 (5·9–9·5) | 8·2 (6·3–10·8) | 21·6 (18·0–25·6) | 21·0 (17·7–24·7) | 24·8 (21·7–28·3) | 16·3 (13·0–20·2) | 19·4 (15·7–23·6) | 31·5 (26·2–37·3) | 13·9 (11·2–17·2) | 20·5 (16·9–24·7) | 38·2 (35·1–41·4) | 30·6 (24·0–38·0) | 35·1 (27·7–43·2) | 49·7 (44·8–54·6) | 37·0 (35·5–38·5) |
| 45–54 | 12·4 (9·7–15·6) | 11·5 (9·2–14·2) | 15·8 (12·4–20·0) | 24·9 (20·9–29·5) | 27·8 (23·2–33·0) | 34·6 (31·0–38·4) | 17·8 (14·9–21·2) | 22·7 (18·9–27·0) | 31·5 (26·7–36·6) | 20·0 (17·0–23·5) | 35·2 (30·9–39·9) | 49·5 (46·5–52·5) | 39·1 (32·2–46·4) | 43·6 (34·7–53·0) | 51·9 (47·5–56·2) | 44·6 (43·1–46·1) |
| 55–64 | 20·9 (16·6–26·1) | 18·0 (14·7–21·7) | 32·0 (24·9–40·1) | 31·7 (26·0–38·0) | 41·9 (35·6–48·6) | 41·9 (37·8–46·0) | 24·9 (20·9–29·4) | 37·9 (32·7–43·3) | 51·3 (45·4–57·1) | 25·9 (22·1–30·2) | 44·7 (38·5–51·2) | 58·0 (54·5–61·5) | 50·8 (42·0–59·5) | 56·7 (47·7–65·2) | 63·7 (60·2–67·1) | 60·7 (59·4–62·0) |
| ≥65 | 35·2 (29·6–41·3) | 28·3 (24·1–32·8) | 46·2 (38·0–54·7) | 53·9 (47·1–60·5) | 50·0 (42·1–58·0) | 50·5 (46·5–54·4) | 46·3 (40·3–52·3) | 59·8 (54·1–65·2) | 71·7 (65·6–77·2) | 41·1 (35·5–47·0) | 68·4 (62·2–74·0) | 73·5 (70·4–76·4) | 65·0 (58·0–71·3) | 78·9 (72·2–84·3) | 81·4 (78·8–83·7) | 80·6 (79·6–81·6) |
| **Women (≥15 years)** | | | | | | | | | | | | | | | | |
| Sample size | 258 | 1302 | 110 | 116 | 546 | 559 | 1036 | 437 | 1367 | 81 | 772 | 5232 | 449 | 896 | 3369 | 35 247 |
| Population estimate (ever daily smokers), millions | 13·3 (10·7–15·9) | 12·5 (10·8–14·1) | 1·1 (0·9–1·4) | 0·6 (0·5–0·7) | 3·1 (2·8–3·4) | 1·1 (1·0–1·2) | 13·5 (11·9–15·0) | 2·8 (2·6–3·1) | 5·7 (5·4–6·0) | 0·2 (0·1–0·2) | 4·5 (4·2–4·8) | 17·5 (16·6–18·3) | 2·7 (2·2–3·1) | 0·4 (0·4–0·4) | 9·5 (9·1–10·0) | 38·6 (38·2–39·0) |
| Former smoking in ever daily smokers, % | 16·8 (11·1–24·5) | 16·2 (12·5–20·8) | 41·3 (31·1–52·3) | 28·6 (18·8–40·9) | 25·0 (20·7–29·7) | 34·4 (29·0–40·3) | 17·1 (14·2–20·5) | 25·0 (20·6–29·9) | 33·7 (30·8–36·7) | 21·2 (12·1–34·5) | 23·9 (20·7–27·4) | 47·7 (46·0–49·4) | 33·1 (27·3–39·6) | 41·0 (36·7–45·4) | 51·4 (49·3–53·4) | 50·5 (49·9–51·2) |
| Age (years) | | | | | | | | | | | | | | | | |
| 15–34 | NA† | 9·1 (2·8–25·9) | NA† | NA† | 15·9 (8·8–26·8) | 26·5 (16·3–40·1) | 14·1 (10·6–18·6) | 26·5 (20·8–33·1) | 26·3 (21·1–32·1) | NA† | 17·2 (13·1–22·1) | 30·7 (27·6–33·9) | 23·3 (16·5–31·8) | 30·5 (23·8–38·1) | 32·9 (29·1–37·1) | 31·7 (30·4–33·1) |
| 35–54 | 5·3 (2·2–12·4) | 13·9 (9·5–19·9) | 32·0 (16·5–52·9) | 23·3 (11·3–42·1) | 20·4 (14·8–27·4) | 30·2 (21·8–40·1) | 11·6 (8·3–15·9) | 20·0 (14·2–27·3) | 27·9 (24·2–32·0) | 14·6 (6·5–29·6) | 24·1 (19·3–29·7) | 46·8 (44·3–49·3) | 29·9 (22·8–38·3) | 41·1 (34·2–48·4) | 45·9 (42·8–49·1) | 45·0 (43·8–46·1) |
| ≥55 | 25·7 (17·3–36·5) | 19·5 (13·8–26·8) | 51·2 (34·5–67·7) | 34·2 (19·7–52·5) | 34·6 (26·9–43·1) | 41·0 (33·4–49·1) | 40·2 (29·1–52·5) | 38·3 (22·6–56·8) | 48·3 (42·2–54·3) | 39·0 (20·5–61·4) | 48·4 (37·7–59·4) | 62·4 (59·3–65·3) | 57·8 (43·9–70·6) | 56·1 (48·2–63·6) | 68·4 (65·9–70·9) | 70·4 (69·5–71·2) |

Data are n, n (95% CI), or % (95% CI). Data from the 2008–10 GATS,[8,9] 2008 General Lifestyle Survey (UK),[10] and the 2006–07 Tobacco Use Supplement to the Current Population Survey (USA).[11] Since there were very few female respondents who had ever smoked daily in some GATS countries, we only include three age groups for women in this table. Combining age categories reduced the number of cells with sample sizes of less than 25 individuals. NA=not available. GATS=Global Adult Tobacco Survey. *GATS measured former smoking in ever daily smokers; the UK study[10] measured former smoking in men who ever regularly smoked cigarettes, cigars, or pipes, and women who ever regularly smoked cigarettes or cigars; and the Tobacco Use Supplement to the Current Population Survey that measured the proportion of individuals who had ever smoked at least 100 cigarettes in their lifetimes who no longer smoke cigarette, cigars, or pipes. †Estimate not reported because sample size was <25 individuals.

*Table 4:* **Percentage of ever daily smokers (and ever regular smokers)* who are former smokers, by sex and age, in the UK, USA, and 14 GATS countries**

smokers and 247 million smokeless tobacco users (56 million smoked and used smokeless tobacco). Of 572 million cigarette smokers, 542 million smoked manufactured cigarettes (82% of all smokers and 64% of tobacco users). The number of tobacco users was highest in China (300·8 million) and India (274·9 million). China had the most smokers of any tobacco product (300·7 million), 284·9 million (94·7%) of whom smoked manufactured cigarettes. India had the most smokeless tobacco users (205·9 million).

Overall in GATS countries, 48·6% (95% CI 47·6–49·6) of men and 11·3% (10·7–12·0) of women were tobacco users; 40·7% (39·6–41·8) of men and 5·0% (4·7–5·3) of women were smokers; and 11·7% (11·0–12·4) of men and 6·7% (6·2–7·2) of women used smokeless tobacco (appendix p 16).

Table 2 and appendix pp 22–27 show age-specific patterns of current smoking. Prevalence in men generally increased into young adulthood or middle age and then declined. In women, we noted differing patterns. In Asian countries and Egypt, prevalence of smoking in women was very low and increased with increasing age. In Poland, Turkey, Brazil, and USA, smoking prevalence increased into young adulthood or middle age and then declined. In other nations, female smoking prevalence was consistently high among young people and declined progressively in older age groups.

For individuals who ever smoked daily, the relative average age of smoking start was older for women than it was for men as age category increased (table 3, appendix pp 28–33). For individuals aged 25–34 years, the mean age of initiation was much the same for both sexes. However, for individuals aged 35 years or older, the average age of initiation was generally older in women than men. All but two of 28 estimates of average age of start of smoking in 25–34 year olds were when individuals were younger than 20 years old. Estimates of average age of initiation of older than 20 years were more common in older cohorts.

We examined prevalence of current smoking in individuals aged 15–34 years with 5-year age categories (appendix pp 34–37). In male smokers aged 15–19 years, prevalence ranged from 5·4% (95% CI, 4·1–7·1) in India to 37·9% (32·2–43·9) in Russia; in female smokers aged 15–19 years, prevalence ranged from 0·0% in Bangladesh and Vietnam to 19·7% (13·8–27·3) in Russia. The prevalence ratio for individuals aged 20–24 years versus 15–19 years was striking for several countries. In male smokers, for example, the prevalence of current smoking in individuals aged 20–24 years in China and Vietnam was 3·5 times that of those aged 15–19 years. Prevalence in female smokers aged 20–24 years in Turkey was seven times that of those aged 15–19 years. This ratio was only less than 1·0 for Chinese women.

Table 4 and appendix p 38 show GATS data for proportion of persons who ever smoked daily and were former smokers at the time of their survey (ie, were abstinent). In general, prevalence of former smoking in ever daily smokers increased with increasing age. Data in appendix pp 39–41 suggest that substantial differences exist in crude as compared with age-standardised estimates of quitting in Bangladesh, Brazil, UK, and the USA. For example, the age-standardised estimate was lower than the crude estimate by 13·5 percentage points for Bangladeshi women and by 11·6 percentage points for men in the UK. In both the crude and age-standardised data, quit ratios were low in China, India, Egypt, Russia, and Bangladesh (<20% overall), and substantially higher in the UK, USA, Brazil, and Uruguay (>35%).

## Discussion

We report data that depict the global epidemic of tobacco use at the start of the 21st century. Collectively, GATS data and surveys from the UK and USA document the enormity of the epidemic and reinforce the need for effective tobacco control (panel 2). Of about 3 billion individuals aged 15 years or older living in the UK, USA, and 14 GATS countries, we estimated that 852 million were tobacco users, including 301 million in China and 275 million in India. Several general patterns can be identified across the surveys that have implications for tobacco-control strategies: smoking disproportionately affects men throughout the world; smoking rates remain lower in women than in men and prevalence is particularly low in women in Asia but is high in Poland, Russia, and the UK; women are increasingly starting to smoke at an equivalent age to men; quit ratios are highest in the UK, USA, and Brazil, but only a small proportion of smokers have stopped in several countries, including China and India; smokeless tobacco use is particularly prevalent in India and Bangladesh and in Thai women; and most tobacco users smoke manufactured cigarettes.

Most studies documenting the risks of cigarette smoking have been undertaken in smokers of manufactured cigarettes,[17] by far the most widely used product, as documented in GATS. These products are technologically designed to mask harshness, provide particular taste sensations, and increase nicotine delivery.[18–20] In addition, the tobacco companies that manufacture these cigarettes use numerous marketing and other strategies throughout the world to increase and sustain consumption.[21,22]

Use of smokeless tobacco and bidis was especially common in India and Bangladesh, where individuals favour two products for chewing, betel with tobacco and tobacco mixed with lime. Both of these products are carcinogenic to human beings[23] and the rates of oral cancer in south-central Asia are among the highest in the world.[24] About 52% of oral cancers in India are attributable to the use of smokeless tobacco products.[25] Bidis produce risks for several diseases that are at least as high as those for manufactured cigarettes.[26,27] Bidis are cheap alternatives to

manufactured cigarettes, because of substantially reduced taxation. They are frequently smoked by poor people who are often illiterate, malnourished, and unaware of the risks. Until recently bidis carried no warning whatsoever.[28]

Our analysis of GATS suggested relatively high levels of waterpipe usage in Vietnam and Russia, which is a finding not previously reported in the scientific literature.[29] Use of hand-rolled cigarettes, a cheaper alternative to manufactured cigarettes, was most common in Thailand, where they were most likely to be smoked by rural, older, less educated, and poorer smokers.[30]

In terms of regional and sex differences, rates of smoking in men in the UK and USA were among the lowest reported. In women, however, rates in the UK and USA were among the highest reported. In men, smoking was very common in Central and Eastern Europe. Rates of lung cancer in men are very high in Hungary, Poland, and Russia.[31] Unless effective tobacco control measures are implemented soon, the future disease burden in Russia, Ukraine, and Turkey will probably be influenced by the high rates of smoking in adolescents and young adults of both sexes in those nations.

With the exception of women in Asian countries and Egypt, the age-specific prevalence of smoking was highest in young adulthood and middle age. A reduced prevalence of smoking in older age groups might be attributable to differential mortality (ie, individuals who did not quit smoking were less likely to survive to older ages) or to a cohort effect (ie, smoking prevalence was lower when individuals were young and they did not start smoking). The reduced prevalence in older individuals might also have been attributable to increased quitting on their part, as they became increasingly aware of the health consequences of smoking.

To reduce the epidemic of diseases caused by tobacco use, countries need to reduce the rate of starting, increase quit attempts and successful cessation, and protect non-smokers. Alarmingly, this study shows that—in most countries we surveyed—age of smoking initiation for women might now be approaching the young ages at which men begin. Many factors contribute to these changes, including the targeting of tobacco products to women via multiple media outlets, such as the cinema,[21,32] and cigarette designs that ease the transition from experimentation to established use.[18] Low prices and absence of effective counter-marketing campaigns also contribute to high rates of uptake.[2]

Quit ratios were low in most GATS countries and in some (eg, China, India, and Egypt) most male smokers do not intend to quit.[2] Quit ratios as low as those in China, India, Egypt, Bangladesh, and Russia have not been noted in the USA for more than 50 years.[16,17] Countries with high quit ratios have undertaken effective public health education campaigns and have benefited from the early discontinuation of smoking by doctors and other health-care leaders.[17,21] Price increases and access to affordable and effective cessation strategies also increase rates of quitting.[2]

### *Panel 2:* Research in context

#### Systematic review

We searched PubMed for reports published before June 25, 2012, without language restriction with the keywords "country name" AND "smok*" AND "national*" AND "representative" entering the 14 GATS countries (China, Bangladesh, Brazil, Egypt, India, Mexico, Philippines, Poland, Russia, Thailand, Turkey, Ukraine, Uruguay, and Vietnam) in place of "country name". We also replaced "representative" with "prevalence" in another search. From these searches and our previous work, we identified 21 studies estimating national smoking prevalence in GATS countries. Two studies[13,14] reported more than one country. One included nationally representative surveys during 2001 and 2010 in eight countries of the former Soviet Union, including Russia and Ukraine.[13] Another study reported smoking prevalence with data from 50 countries' 2002–03 World Health Surveys.[14] This study used an overall estimate of smoking prevalence from representative surveys in Bangladesh, Brazil, Mexico, Philippines, Turkey, Ukraine, Uruguay, and Vietnam. Data from more than 135 countries, using various surveys, are compiled by WHO[2] and in The Tobacco Atlas.[3] WHO also publishes reports with regional data.[15]

#### Interpretation

Our report expands previous work by estimating the prevalence of 15 indicators of tobacco use and cessation, by sex, in 14 low-income and middle-income countries that participated in Wave 1 of the Global Adult Tobacco Survey. It also permits comparisons with many similar indicators in the USA and the UK. GATS employs consistent and rigorous methodologies, permitting comparisons between countries and provides baseline data for monitoring of future trends. Our results document tobacco use in 852 million people (including 301 million in China and 275 million in India) and suggest that in many of the countries we surveyed the age of initiation of daily smoking among women seems to have become as young as it is in men and that smoking cessation in people in China, India, Egypt, Bangladesh, and Russia who have ever smoked daily is as low as was noted in the USA in the 1950s.[16,17] This monitoring activity could help guide and assess future tobacco-control activities.

In 2011, tobacco control was identified as the "most urgent and immediate priority" intervention to reduce non-communicable diseases.[33] The United Nations high-level meeting on non-communicable diseases echoed the urgency of controlling of tobacco use. To reduce worldwide smoking prevalence by 30% by 2025, countries are exhorted to fully implement the Framework Convention on Tobacco Control.[7,34] WHO defines optimum policies on smoke-free air, cessation, warning labels, mass media, marketing bans, and taxation, which, if fully implemented worldwide, would have an enormous effect on reduction of premature mortality.[2] Although 1·1 billion people have been covered by the adoption of the most effective tobacco-control policies since 2008, 83% of the world's population are not covered by two or more of these policies.[2]

This study had limitations. The data used in this report were based on self-report and thus are subject to misclassification bias: however, estimates obtained from population-based surveys that use self-report are generally valid, apart from when there is a high demand for abstinence.[35,36] In some countries, where smoking is socially unacceptable in women or young people, household-based estimates of smoking prevalence made

on the basis of self-report might underestimate the true prevalence. The number of cigarettes smoked every day might also be under-reported. Furthermore, the first wave of GATS did not include several low-income and middle-income countries (eg, Indonesia, Pakistan, and Nigeria) with large populations of smokers. Indonesia and Nigeria are participating in the second wave of GATS and Pakistan is scheduled to participate in Wave 3. Comparability of indicators from the General Lifestyle Survey and Tobacco Use Supplement with those from GATS might be limited by differences in the questionnaire content and sampling techniques, and by the relatively low response rate (56·9%) in the Tobacco Use Supplement.

Our findings from the first wave of GATS come at a crucial point in tobacco control, several years after the ratification of the Framework Convention on Tobacco Control. The use of a standardised method will be especially important as countries monitor their trends over time. GATS has already been repeated in Thailand and Turkey and it will be repeated in all Wave 1 countries in the coming years. GATS has been expanded to 17 new countries, and many others have expressed interest. Wave 1 results document the heterogeneity of the tobacco epidemic across the world and the diverse challenges for tobacco control, particularly the need to reduce or maintain low smoking rates among women, to reduce initiation by young people, and to increase quitting rates in all smokers.

In part because of the first wave of GATS, almost half of the world's population is receiving adequate monitoring of tobacco use.[2] A 22-item subset of questions, called *Tobacco Questions for Surveys*, is available for nations unable to undertake the entire survey.[37] A subset of these questions can also be recommended on the basis of country-specific needs. Another technique for assessment purposes is the International Tobacco Control Policy Evaluation Project, which is designed to assess Framework Convention on Tobacco Control polices by use of cohort studies with several country controls.[38]

The first wave of GATS showed that comparable nationally representative data can be obtained in 14 low-income and middle-income countries. These surveys address capacity needs of countries[15] and should be used to promote implementation of effective strategies for tobacco control.[2,4]

#### Contributors

GAG, SAM, JMS, and PCG were principally responsible for writing of the paper. GAG, SAM, JMS, PCG, NB, and RP designed the presentation of the study with input from all other authors. GAG took the lead on analysis and interpretation of all findings with support from SAM. JH and KMP were involved in Global Adult Tobacco Survey (GATS) survey sampling design and GAG and JM were involved in GATS survey questionnaire design, with input from PCG and WZ. MJ analysed and took the lead for all General Lifestyle Survey data. GAG took the lead for all US Tobacco Use Supplement to the Current Population Survey data. SAM, JH, JM, and KMP provided input and technical support for GATS data collection along with members of the GATS Collaborative Group. SA was responsible for obtaining funding and overall project collaboration. GAG and SAM did literature searches and finalised the references. GAG and SAM led subsequent revisions with all authors providing reviews of and comment on successive drafts.

#### Conflicts of interest

We declare that we have no conflicts of interest.

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