

# A cross-country study of cigarette prices and affordability: evidence from the Global Adult Tobacco Survey

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## ABSTRACT

**Objective** To describe the characteristics of two primary determinants of cigarette consumption: cigarette affordability and the range of prices paid for cigarettes (and bidis, where applicable) in a set of 15 countries. From this cross-country comparison, identify places where opportunities may exist for reducing consumption through tax adjustments.

**Data** Self-response data from 45,838 smokers from 15 countries, obtained from the Global Adult Tobacco Survey (GATS) 2008–2011.

**Design** Using self-response data on individual cigarette expenditure and consumption, we construct a measure of the average cigarette price smokers pay for manufactured cigarettes (and bidis, where applicable) in 15 countries. We use these prices to evaluate cigarette affordability and the range of prices available in each country. These survey-derived measures of cigarette price and affordability are uniquely suited for cross-country comparison because they represent each country's distinctive mix of individual consumption characteristics such as brand choice, intensity of consumption, and purchasing behavior.

**Results** In this sample of countries, cigarettes are most affordable in Russia, which has the most room for tobacco tax increase. Affordability is also relatively high in Brazil and China for cigarettes, and in India and Bangladesh for bidis. Although the affordability of cigarettes in India is relatively low, the range of cigarette prices paid is relatively high, providing additional evidence to support the call for simplifying the existing tax structure and reducing the width of price options. China has both high affordability and wide price ranges, suggesting multiple opportunities for reducing consumption through tax adjustments.

## INTRODUCTION

Raising the price of tobacco through taxation is an effective policy intervention for tobacco control.<sup>1–4</sup> Tobacco consumption drops in response to higher prices<sup>1–4</sup>; this response has been shown to be larger in low-income countries than in high-income countries (HICs).<sup>2–4</sup> Seeking to reduce tobacco use worldwide, the WHO's Framework Convention for Tobacco Control has called for higher taxes and prices for tobacco products,<sup>5</sup> and the WHO has included raising taxes as a primary component in its MPOWER<sup>1</sup> strategies for tobacco control.<sup>1</sup> Similarly, the World Bank has called on governments to raise total taxes on tobacco products to a

tax share of at least two-thirds of the final price.<sup>6</sup> Most recently, the WHO emphasised the value of targeted tobacco excise taxes and recommended setting their level at a 70% share of the final price.<sup>7</sup> Even with these targets, most countries are far from reaching the recommended level of tobacco taxation.<sup>1</sup> Furthermore, tobacco taxes in low- and middle-income countries (LMICs) tend to be lower than those in HICs, despite the fact that tobacco use in many LMICs is rising.<sup>1–7</sup> In recent years, rising incomes in LMICs have made tobacco products more affordable, thus reducing economic barriers to consumption.<sup>8</sup> This trend underscores the need to persist with the effort of raising tobacco taxes in LMICs in order to offset the increase in tobacco affordability and discourage consumption.

This study examines patterns in the prices paid for smoked tobacco products (cigarettes and bidis) across a set of 15 mostly LMICs using recent data from the Global Adult Tobacco Survey (GATS). We use these patterns to identify opportunities for strengthening tobacco tax policy in two ways. We first describe cross-country differences in cigarette prices paid using a GATS-derived price measure that is representative of the unique consumption characteristics of smokers in each country; based on this price measure, we estimate the relative affordability of cigarette prices. Countries where cigarettes are relatively more affordable are likely to have considerable room for increasing tobacco taxes. We then use the individual-level detail that GATS provides on each smoker's cigarette spending to evaluate the extent to which cigarette prices paid vary across smokers within a given country and provide information on the range of prices paid in each country. Evaluating the within-country variability of prices is important since a wider range of prices can facilitate substitution towards lower priced tobacco products instead of reducing consumption.<sup>7–9</sup> Therefore, countries where the prices of cigarettes vary widely may have additional room for changes in their tobacco tax structure. In summary, this paper uses one of the unique

<sup>1</sup>MPOWER is an acronym summarising the main goals of the WHO Framework Convention for Tobacco Control, as follows: M, Monitor tobacco use and prevention policies; P, Protect people from tobacco smoke; O, Offer help to quit tobacco use; W, Warn about the dangers of tobacco; E, Enforce bans on tobacco advertising, promotion and sponsorship; R, Raise taxes on tobacco.

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advantages of GATS—namely, the fact that it provides standardised information on both cross-country and within-country variability of cigarette prices paid—to identify opportunities for raising taxes and prices in accordance with the MPOWER goals of reducing tobacco use.

### Background and motivation

Historically, cross-country studies of cigarette prices and affordability have defined price as the retail price of a specific brand such as the most sold local brand.<sup>8 10–12</sup> The limitation of this standard approach is that a comparison of single-brand retail prices fails to account for the variability of cigarette prices within countries (brand price variation) and also fails to fully account for some of the reasons why price levels may differ across countries. This can reduce the precision of traditional cross-country comparisons of prices and affordability. The present study introduces a new survey-based approach for evaluating both cross-country and within-country price variability and identifies the policy implications from these previously unavailable data.

We use self-reported data on individual cigarette spending from 45 838 individual smokers in 15 countries to construct a measure of the average price smokers pay per 20 cigarettes in each country. This price measure represents the actual cigarette price level across countries in ways that the retail price of a single cigarette brand cannot. First, the average price paid reflects the variety of brands and prices that are available in each market. In contrast, the retail price of a single brand—even if it were the price of the most sold brand—may not necessarily be representative of what smokers actually pay for cigarettes in countries where a substantial number of smokers diverge from the most sold brand. The GATS-derived price measure can vary across countries depending on what proportion of smokers in each country buy cigarettes that are cheaper (or more expensive) than the most sold brand; this source of cross-country variability would be missed when comparing most-sold retail prices only.

Second, the GATS-derived price measure accounts for differences in purchasing style of smokers across countries. Not all smokers buy cigarettes in packs, and it is very common in some LMIC to buy cigarettes individually (eg, India, Bangladesh). Frequent purchasing of cigarettes by the stick may have a non-trivial impact on the average cigarette price level because single-stick purchases typically correspond to a higher price per stick than pack purchases. This source of cross-country price variation would not be reflected in the retail price of a full pack but would be captured by the GATS-derived aggregate price measure.

Third, the GATS-derived price measure can pick up differences in prices across the different venues where individuals can purchase cigarettes. In each country, cigarette prices can vary across venues depending on commercial factors, the prevalence of tax avoidance or counterfeiting; this source of cross-country price variation would not be evident in traditional price measures which are typically obtained from one or two types of outlets per country or from producers' price lists.

Finally, the GATS-derived price measure recognises that the price level can differ across countries based on differences in consumption intensity among smokers in each country. Consumption intensity affects smokers' choices of what price category of cigarettes they consume. By the law of demand, high-volume smokers tend to select cheaper cigarettes. Because our average price measure is consumption weighted, it recognises that country-specific consumption patterns are a factor that drives the variability in overall prices paid across

countries—for two countries with a similar income level and population but very different cigarette use intensities, prices are more likely to cluster at the lower end for the country with high-volume smokers.

Besides using GATS-derived aggregate prices to describe what smokers pay for cigarettes across countries, this paper uses these prices to measure and compare cigarette affordability across countries. Cigarette prices and their relative affordability across countries and over time have been discussed in a number of prior studies.<sup>8 10–12</sup> The goal of cigarette affordability studies is to adjust cigarette prices in a way that accounts for differences in income and income growth across countries. Affordability has been defined, alternatively, as cigarette prices in terms of minutes of labour,<sup>12</sup> cigarette prices as a proportion of gross domestic income (GDP)<sup>8 11</sup> or cigarette prices as a proportion of daily income.<sup>10</sup> Although prior studies explore different measures of affordability, all of them use the retail price of a single cigarette brand or a few prominent brands. We define affordability as price relative to income similar to Blecher and van Walbeek,<sup>11</sup> but we estimate it using GATS-derived average prices paid instead of the retail price of a single brand. Our measure of affordability provides further insight into the differences in affordability across countries because it accounts for differences that can occur from differences in the retail price across countries as well as from country-specific smoking behaviours and patterns of consumption that can affect the average price level.

### SOURCES AND METHODS

#### Prices

Cigarette prices are derived from the GATS.<sup>13</sup> The GATS is a nationally representative household survey of non-institutionalised men and women aged 15 years and older. It employs a complex multistage sampling design and has been conducted in 15 countries in various years from 2008 to 2011. The GATS tracks individual tobacco use behaviour, attitudes and environment and contains questions that record individual spending on smoked tobacco products. Using responses to these questions, we are able to calculate the most recent price each individual paid for cigarettes, as follows. From the question 'The last time you bought cigarettes for yourself, how many cigarettes did you buy?' we obtain the unit of purchase (individual cigarettes, packs or cartons) and the number of cigarettes in each unit. From the question 'How much did you pay for this purchase?' we obtain the overall purchase amount in local currency. For each smoker, we then calculate the price per stick by dividing the reported purchase cost by the number of cigarettes in the purchase and we then multiply the single-stick price by 20 to estimate the price per 20 sticks. Although this price corresponds to the same quantity of cigarettes typically found in manufactured cigarette packs, it is not the same as a price per pack because it represents non-pack purchases as well. In the case of India and Bangladesh, the same process is repeated to calculate the price each smoker pays for 20 bidi sticks. Prices in the GATS are not available for roll-your-own cigarettes and tobacco products other than manufactured cigarettes and bids.

GATS prices are originally recorded in local currency. To compare them across countries, we convert them into a common dollar currency using the country- and survey year-specific Purchasing-Power Parity (PPP) conversion factor. The PPP factor is the number of local currency units required to buy the same amount of goods and services in the domestic market as US\$1 in the USA and is a means for consistently comparing prices across countries while also taking into account differences

**Table 1** Cross-country comparison of cigarette prices paid per 20 sticks, in Purchasing Power Parity adjusted constant 2009 dollars (PPP USD)

	Bangladesh		Brazil	China	Egypt	India		Mexico	Philippines	Poland	Romania	Russia	Thailand	Turkey	Ukraine	Uruguay	Vietnam
	Manufactured cigarettes	Bidis				Manufactured cigarettes	Bidis										
Overall																	
Mean	1.15	0.16	1.68	1.68	1.47	2.76	0.43	3.32	0.81	4.17	4.72	1.18	2.66	3.57	1.38	3.30	1.00
Median	0.74	0.18	1.68	1.25	1.35	2.43	0.29	3.47	0.63	4.09	5.00	0.97	2.68	3.19	1.26	3.59	0.72
Range of cigarette prices paid																	
Mean of Quintile 1 of prices paid	0.50	0.05	0.95	0.52	0.99	1.01	0.15	1.97	0.34	3.03	3.41	0.40	1.90	2.55	0.95	1.80	0.49
Mean of Quintile 2 of prices paid	0.74	0.15	1.48	0.85	0.99	2.43	0.25	2.99	0.53	4.03	4.72	0.70	2.63	3.04	1.19	3.24	0.63
Mean of Quintile 3 of prices paid	1.26	0.18	1.71	1.24	1.35	2.98	0.31	3.54	0.63	4.15	4.99	0.89	2.83	3.31	1.27	3.59	0.97
Mean of Quintile 4 of prices paid	1.48	0.18	1.95	1.77	1.42	3.60	0.37	4.64	0.91	4.59	5.11	1.32	2.98	4.00	1.47	3.71	1.69
Mean of Quintile 5 of prices paid	2.40	0.25	2.55	3.21	2.19	5.14	1.62	6.76	1.54	5.04	5.36	2.22	3.67	5.22	1.88	4.33	2.05
By unit of purchase																	
Mean price paid for purchases by stick	1.30	0.18	1.78	2.17	1.51	3.14	0.70	5.66	0.95	4.34	5.15	1.19	2.97	3.83	1.52	3.45	1.36
Mean price paid for purchases by pack	0.74	0.14	1.66	1.72	1.47	2.21	0.28	2.94	0.63	4.20	4.73	1.25	2.54	3.58	1.39	3.28	0.93
By smoking intensity																	
Mean price paid by light to medium smokers (0–10 sticks/day)	1.32	0.17	1.72	1.94	1.49	2.86	0.57	3.78	0.97	4.21	4.89	1.57	2.84	3.70	1.53	3.58	1.19
Mean price paid by heavy smokers (10+ sticks/day)	1.09	0.16	1.67	1.65	1.47	2.64	0.40	3.04	0.78	4.17	4.71	1.16	2.61	3.56	1.38	3.26	0.97
Country-specific characteristics of the currently smoking population																	
% Cigarettes purchased by stick	83.1	59.7	26.4	2.6	5.7	68.0	41.3	38.1	69.1	1.3	6.7	0.9	46.3	1.1	7.6	38.2	30.6
% Smokers who are heavy smokers (10+ sticks/day)	38.7	61.1	58.1	71.2	89.9	12.6	45.4	17.4	47.2	78.0	79.9	75.0	43.4	72.5	79.1	53.6	54.0
Gross domestic income per capita (PPP USD)	1487	1487	11123	7253	6114	3015	3015	13609	3516	18 050	11029	14 913	8051	14495	6004	13 144	2861
Sample size	1400	877	4659	3423	3217	4455	5865	1645	2455	2145	994	4453	2975	2320	2191	1030	1734

Prices are for manufactured cigarettes, unless noted otherwise. Estimates are weighted with sample weights for complex survey design, weighted by individual consumption (number of cigarettes smoked) and adjusted for individual price outliers.

## Research paper

in the standards of living. Since survey years vary across countries, we also adjust prices for inflation relative to 2009 levels for countries that were surveyed in years other than 2009 (Brazil, Turkey, 2008; China, Ukraine, Vietnam, 2010; Romania, 2011). PPP conversion factors and inflation adjustment rates are obtained from the International Monetary Fund (IMF) World Economic Outlook Database.<sup>14</sup> Once individual-level prices paid are converted into PPP-adjusted constant 2009 US dollars, they are aggregated at the country level to summarise the price level of cigarettes in each country. These national price levels are described by the mean and median prices paid and are calculated for different demographic strata such as age, gender or education. Since GATS is a complex multistage survey, appropriate sampling weights are used.<sup>15</sup> When aggregating individual prices paid into national average prices paid, we further weight them by the intensity of individual consumption, defined as number of cigarettes smoked. Thus, the average price measure represents high-volume smokers more than lighter smokers and reflects the consumption patterns of the population. Each individual's self-reported price paid for cigarettes depends on the manner of purchase (stick vs pack) or the source of purchase (store, street vendor, etc) and may not always correspond to an official retail price. The implication is that when individual prices paid are aggregated on the country level, the resulting aggregate price paid is reflective of the population's purchasing patterns. At the country level, the GATS-derived measure of prices also represents individual brand preferences to the extent that different brands may differ by price.

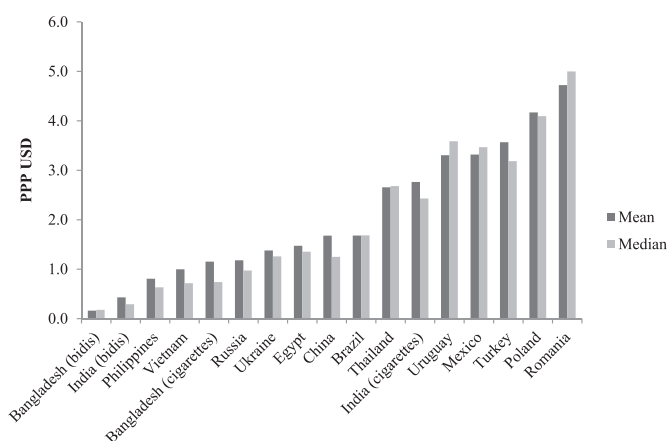
### Affordability

Affordability is evaluated by the relative income price (RIP) of cigarettes. RIP was first defined by Blecher and van Walbeek<sup>11</sup> as the proportion of per capita GDP required to purchase 100 cigarette packs in PPP-adjusted constant 2009 dollars. In other words, RIP represents the price of cigarettes in each country relative to the country's income, and lower RIP corresponds to higher affordability. In this study, we define affordability as the proportion of per capita GDP required to purchase 2000 cigarette sticks at the median price paid per stick. While per capita GDP has certain limitations as a measure of country income (it does not reflect the wealth distribution within countries), it remains the most standardised representation of income in a cross-country setting; PPP-adjusted GDP per capita figures for this study were obtained from the IMF World Economic Outlook Database.<sup>14</sup> Due to our approach for deriving prices, our measure of RIP affordability encompasses differences in income across countries and differences arising from country-specific smoker characteristics such as price/brand preference, consumption and purchasing style.

## RESULTS

### Prices

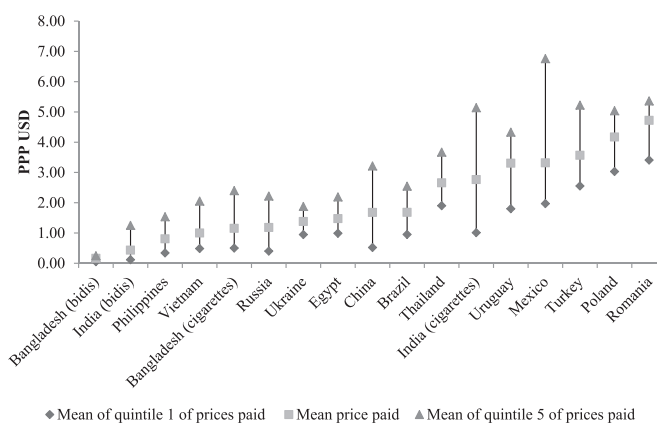
Table 1 shows the GATS-derived prices paid per 20 manufactured cigarettes across our sample of countries. Prices calculated in the same manner for bidis are also presented for India and Bangladesh. We list the median in addition to mean prices paid in each country since median prices are less vulnerable to individual outliers and may provide a more representative description of the overall price level in each country. Comparing mean with median prices is also useful for describing consumption preferences among smokers in each country. In most countries, the mean cigarette price paid is higher than the median price, indicating that the majority of smokers purchase cigarettes cheaper than the mean price, while a relative minority of



**Figure 1** Mean and median prices paid per 20 sticks (in PPP-adjusted constant 2009 USD). Prices are for manufactured cigarettes unless bidis are noted.

smokers drives up the mean price by choosing to smoke more expensive cigarettes (figure 1). The highest mean cigarette price is paid by smokers in Romania (4.72 PPP USD per 20 cigarettes), while cigarette smokers pay the least, on average, in the Philippines (0.81 PPP USD per 20 cigarettes). In markets where bidis are consumed, such as India and Bangladesh, smokers pay much less for bidis than for cigarettes. In Bangladesh, the mean price paid per 20 bidis is one-seventh the size of the price paid for the same number of cigarettes (0.16 vs 1.15 PPP USD), and the bidi-cigarette price differential is similarly large in India (0.43 vs 2.76 PPP USD).

We describe the range of prices paid within each country by arranging each country's individual prices paid for 20 cigarettes into quintiles and estimating the means of each quintile (table 1). Figure 2 illustrates the width of price options in each country. The range of cigarette prices paid by smokers in this set of countries is widest in Mexico, India and China; substitution possibilities across price categories are correspondingly highest in these countries. In bidi markets, the range of prices paid for bidis is much tighter in Bangladesh than in India, where some prices paid for bidis can exceed some of the prices paid for cigarettes. Another aspect worth noting in figure 2 is how mean prices compare with the lowest and highest quintile means in each country. In most of the 15 countries, the mean price is



**Figure 2** Ranges of prices paid per 20 sticks (in PPP-adjusted constant 2009 USD). Prices are for manufactured cigarettes unless bidis are noted.

**Table 2** Mean cigarette prices paid per 20 sticks by demographic group, in Purchasing Power Parity-adjusted constant 2009 dollars

	Bangladesh		Brazil	China	Egypt	India		Mexico	Philippines	Poland	Romania	Russia	Thailand	Turkey	Ukraine	Uruguay	Vietnam	
	Manufactured cigarettes	Bidis				Manufactured cigarettes	Bidis											
Overall	1.15	0.16	1.68	1.68	1.47	2.76	0.43	3.32	0.81	4.17	4.72	1.18	2.66	3.57	1.38	3.30	1.00	
Residence																		
Urban	1.30	0.16	1.70	2.07	1.58	2.93	0.41	3.32	0.95	4.22	4.75	1.28	2.70	3.63	1.44	3.32	1.27	
Rural	1.06	0.16	1.47	1.38	1.37	2.61	0.43	3.28	0.70	4.08	4.69	0.90	2.62	3.37	1.25	3.09	0.85	
Gender																		
Male	1.15	0.16	1.68	1.68	1.47	2.77	0.41	3.29	0.81	4.16	4.70	1.12	2.66	3.60	1.35	3.33	1.01	
Female	0.71	0.19	1.66	1.48	2.20	1.72	0.86	3.41	0.81	4.18	4.78	1.43	2.67	3.37	1.57	3.26	0.70	
Age (years)																		
15–24	1.40	0.18	1.73	1.87	1.53	2.83	0.40	3.75	0.98	4.31	4.68	1.54	2.85	3.74	1.62	3.61	1.23	
25–44	1.15	0.16	1.66	1.85	1.48	2.84	0.40	3.41	0.83	4.29	4.79	1.29	2.65	3.66	1.45	3.32	1.03	
45–64	1.04	0.16	1.69	1.51	1.44	2.65	0.45	3.01	0.68	4.04	4.69	0.95	2.55	3.32	1.22	3.19	0.90	
65+	0.93	0.16	1.60	1.11	1.40	2.52	0.48	3.05	0.59	3.98	4.30	0.72	2.43	3.05	1.05	2.95	0.82	
Education																		
No formal education/less than primary	1.00	0.16	NA	1.02	1.38	2.47	0.44	2.82	0.63	3.64	NA	0.60	2.52	3.16	1.55	2.82	0.78	
Completed primary/less than secondary	1.29	0.16	NA	1.28	1.39	2.76	0.39	3.30	0.70	3.91	NA	0.61	2.71	3.39	1.25	3.18	0.96	
Completed secondary/completed high school	1.54	0.15	NA	1.77	1.49	2.84	0.51	3.54	0.93	4.17	NA	1.06	2.67	3.79	1.35	3.45	1.12	
Completed college	1.89	NA	NA	2.68	1.85	3.17	0.29	3.27	1.07	4.42	NA	1.55	2.70	3.98	1.58	3.51	1.45	

Prices are for manufactured cigarettes, unless noted otherwise. Estimates are weighted with sample weights for complex survey design, weighted by individual consumption (number of cigarettes smoked) and adjusted for individual price outliers.

**Table 3** Affordability of cigarettes (relative income price (RIP))

	Bangladesh		Brazil	China	Egypt	India		Mexico	Philippines	Poland	Romania	Russia	Thailand	Turkey	Ukraine	Uruguay	Vietnam
	Manufactured cigarettes	Bidis				Manufactured cigarettes	Bidis										
RIP*	5.0%	1.2%	1.5%	1.7%	2.2%	8.1%	1.0%	2.5%	1.8%	2.3%	4.5%	0.7%	3.3%	2.2%	2.1%	2.7%	2.5%

\*RIP is the ratio of the median price paid for 2000 cigarettes to per capita gross domestic income in PPP-adjusted constant 2009 dollars (PPP USD). Lower RIP implies higher affordability and vice versa.



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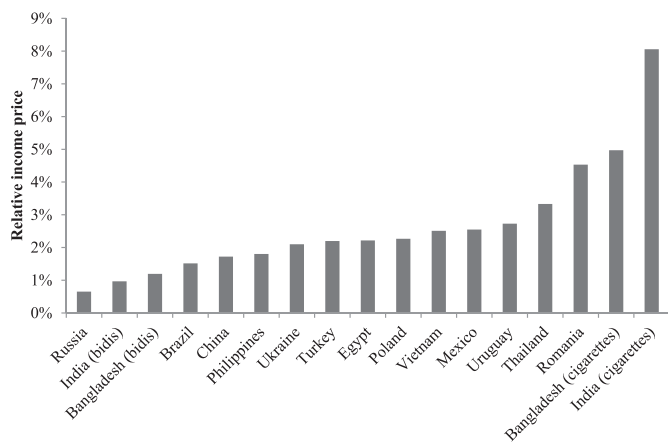
closer to the lowest price quintile than it is to the highest quintile, reflecting the fact that most cigarettes smoked within a country are relatively cheap. This is less true of Romania, Uruguay and Poland, where higher prices tend to predominate in the range of choices.

In all countries, cigarettes are more expensive when purchased as individual sticks rather than packs (table 1). This is more likely to impact the overall price level in countries where a large proportion of smokers buy their cigarettes by the stick (India, Bangladesh, Philippines) than in countries where purchasing preferences are more uniform (Poland, Russia). In almost all countries, the heaviest smokers (those smoking more than 10 sticks per day) pay less for their cigarettes than those who smoke fewer than 10 sticks daily (table 1). This is more likely to impact the overall price level in countries with larger proportions of heavy smokers (China, Egypt, Poland, Russia).

While prices paid can vary widely across smokers from different demographic groups within a country, we found that these patterns tend to be similar across countries (table 2). In all countries, urban residents buy more expensive cigarettes than rural residents. Gender differences vary by country and are not so pronounced. On average, men tend to buy more expensive cigarettes than women, but there are multiple exceptions (ie, Egypt, Mexico, Russia, Poland, Ukraine). In all countries, a clear pattern emerges across age groups, with younger smokers spending more per cigarette than older smokers. A clear pattern is also evident across education levels, with more educated smokers spending more per cigarette than less educated smokers. Since education is closely correlated with income, this may point to a positive income effect—that is, higher socio-economic status allows the consumption of more expensive cigarettes.

### Affordability

A cross-country comparison of affordability is shown in table 3. Affordability is calculated as the proportion of per capita GDP necessary to buy 2000 cigarettes at the median price smokers pay for cigarettes. The ratio of cigarette prices to income is known as RIP, with a higher RIP indicating lower affordability and vice versa. By far, the most affordable cigarettes are sold in Russia (figure 3). Cigarettes in Russia are so cheap relative to the population's average income that they are more affordable



**Figure 3** Affordability of prices paid across 15 Global Adult Tobacco Survey countries. Affordability is measured as the relative income price (the median price paid per 2000 sticks as % of per capita gross domestic product in PPP-adjusted constant 2009 dollars). Prices are for manufactured cigarettes unless bidis are noted.

than bidis are in India and Bangladesh (for instance, RIP is 0.7% for Russian cigarettes and 1% for Indian bidis). Russia is also the only country in our sample where RIP is below 1%. The country with the second highest affordability of manufactured cigarettes is Brazil (RIP 1.5%), followed closely by China (RIP 1.7%).

Manufactured cigarettes are least affordable in India and Bangladesh (RIP of 8.1% and 5%, respectively). Although cigarette smokers in India and Bangladesh do not pay the highest cigarette prices in our sample of countries, their relatively low per capita GDP renders even moderately priced cigarettes relatively unaffordable. Following India and Bangladesh, cigarettes also have low affordability in Romania (RIP 4.5%) and Thailand (RIP 3.3%) where the average price paid for cigarettes is relatively high. It is interesting to note that the tobacco markets in countries in our sample where manufactured cigarettes are relatively less affordable tend to have a large presence of cheaper substitutes (bidis in India and Bangladesh and roll-your-own cigarettes in Thailand), pointing to the key role that prices play in consumption decisions.

### DISCUSSION AND CONCLUSIONS

The level of tobacco prices across countries and their range within countries is influenced by multiple factors that interact with and sometimes counteract each other. Among these are each nation's domestic income, tax structure, consumption intensity among smokers, purchasing preferences, brand preferences and extent of excise tax avoidance. In our sample, higher cigarette prices are observed in countries at the higher end of the income spectrum: Romania, Poland, Turkey, Mexico and Uruguay (table 1). In general, smokers tend to pay more for cigarettes in wealthier countries even after accounting for purchasing power differences. This may in part reflect the higher tax level in HICs: Poland, for instance, has among the highest tobacco tax burdens in the world.<sup>7</sup> One notable exception is Russia which has among the highest per capita incomes in the sample but where the cigarette price paid by the median smoker is among the lowest (0.97 PPP USD). The reverse holds for India, where per capita income is relatively low but where cigarette taxes on average tend to be higher and cigarette smokers pay considerably higher prices (2.43 PPP USD at the median). Since these prices are derived from self-reported survey data, they are subject to survey-related limitations such as reporting bias.

In addition to the overall price level, the range of tobacco price categories available for smokers to choose from in each country provides additional insight into the factors shaping tobacco use. A wider range of prices may undermine the impact of tobacco tax policy because it provides opportunities for substitution from higher priced to cheaper products. We found that the range of cigarette prices paid among the countries in our sample is largest in Mexico, India and China (figure 2). Jha *et al*<sup>16</sup> emphasised the need for simplifying and adjusting the tobacco taxation system in India. This could reduce the wide price differentials among cigarette brands in India and may reduce the gap between bidi and cigarette prices. Currently, both India and China have tiered tobacco tax structures in which cheaper cigarettes are taxed at lower rates than more expensive cigarettes, further accentuating the price differentials. A uniform high excise tax rather than a tiered tax structure is likely to reduce the range of cigarette prices in each of these countries. Although China recently introduced cigarette tax increases, there is evidence that the tax changes have been absorbed at the government-owned producer level and have not

affected the prices paid by the consumer.<sup>17</sup> This underscores the open possibilities that remain in China for both raising prices in an effective manner and reducing the range of available prices. In contrast to many countries where the market appears to be dominated by cigarettes from the lower price range, Romania, Uruguay and Poland are countries where the majority of purchased cigarettes fall in the upper half of the price range (figure 2), possibly indicating that tax policy may have been successful in limiting the array of cheap cigarettes in these countries.

The level of cigarette prices is not necessarily an indicator of their relative affordability, and price can take on a new meaning when viewed in reference to income. For instance, among the countries in our sample, Poland has some of the highest cigarette prices yet these prices remain relatively affordable due to the country's high income (figure 2). In contrast, the average cigarette prices paid in Russia are both low in size and affordable relative to other countries. In the 15 countries studied, we found that the most affordable cigarettes are sold in Russia, followed by Brazil and China. All of these countries have exhibited recent economic growth and rising GDP. However, their ratio of cigarette prices to per capita GDP have remained low, indicating that cigarette prices, and, in particular, tobacco taxation, may not have kept up with the growth in income. From a tobacco control perspective, this poses a significant concern since these are countries with large populations and many smokers. As countries develop economically, increases in income can result in further increases in cigarette consumption; to counteract this trend, cigarette prices need to grow at a rate higher than real income.

Table 4 lists the 15 countries in order of affordability and compares this country ranking to a ranking of a similar set of countries obtained from Blecher and van Walbeek (2008).<sup>8</sup> Affordability estimates from the two studies are not directly comparable due to differences in the studies' time frames and

their respective definitions of price. However, in both studies, Russia stands out as the country that had the most affordable cigarettes, and by extension, ample room for a tobacco tax increase. In both studies, India and Bangladesh have the least affordable cigarettes. Since the market in India and Bangladesh is dominated not by cigarettes but by bidis, another easily identified opportunity for tax increases is in the market for bidis. Closing the gap between the price of bidis and cigarettes, while difficult to achieve in practice, is likely to be critical for reducing bidi use in India and Bangladesh.

As the first descriptive cross-country analysis of prices and affordability to use data from the GATS, the present study points to several research questions in the economics of tobacco control that can be addressed using this data set. One area of future research is a comparison of survey-derived self-reported prices to official retail prices. Differences between list prices and prices actually paid by smokers reflect variations in tobacco excise tax structure and in tax avoidance incentives faced by smokers. These and other questions can be productively addressed using the GATS data to inform stronger tobacco tax policy country by country.

### What this paper adds

We describe GATS-derived measures of cigarette prices and affordability, which represent each country's distinctive mix of consumption characteristics such as brand choice, intensity of consumption and purchasing behaviour. By using these price measures to compare the average level of prices paid, the range of prices paid and their affordability, we identify places where opportunities may exist for reducing consumption through tax adjustments in a set of 15 countries.

**Table 4** Comparison of affordability rankings of manufactured cigarettes

Country affordability ranking from present study*	Country affordability ranking from Blecher and van Walbeek†
Most affordable (lowest RIP)	
Russia	Russia
Brazil	Mexico
China	Poland
Philippines	Romania
Ukraine	Brazil
Turkey	Uruguay
Egypt	Philippines
Poland	Thailand
Vietnam	Turkey
Mexico	China
Uruguay	Vietnam
Romania	Egypt
Thailand	India
Bangladesh	Bangladesh
India	
Least affordable (highest RIP)	

\*Ranking based on RIP calculated as the Global Adult Tobacco Survey-derived median price paid for 2000 cigarettes relative to per capita GDP in PPP-adjusted constant 2009 dollars.

†Ranking based on RIP calculated as the retail price of 100 packs of the most-sold brand as % of capita GDP for year 2006, as reported in Blecher and van Walbeek (2008).

GDP, gross domestic income; RIP, relative income price.

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**Data sharing statement** All data included in this study are publicly available through the Global Adult Tobacco Survey.

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## **A cross-country study of cigarette prices and affordability: evidence from the Global Adult Tobacco Survey**

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