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# The cigarette market in Brazil: new evidence on illicit practices from the 2019 National Health Survey

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## ABSTRACT

**Objective** To explore new evidence on illicit practices, such as selling legal brands below the minimum legal price (MLP), and smugglers selling illicit brands at or above the MLP.

**Methods** For the first time in Brazil, self-reported information on cigarette brand name and price paid per pack in smokers' last purchase from a nationally representative survey conducted in 2019 was used to distinguish the illicit and the legal markets. We estimated the proportion of illicit cigarette consumption, using the combination of brand and price.

**Results** The proportion of smuggled illicit cigarette consumption based on brands not approved on the Brazilian market was estimated at 38.6% (95% CI: 35.8% to 41.5%). When we added legal brands not paying taxes, it increased to 47.1% (95% CI: 44.2% to 49.9%). Around 25% of illicit brand cigarettes were sold at or above MLP.

**Conclusions** In Brazil, since 2017 there is a lack of adjustment in tobacco taxes and the MLP for inflation and income growth. The increase in cigarette affordability and the presence on the market of a segment of 'higher-priced' illicit brands suggest patterns of illicit brand loyalty and/or perceived 'brand quality' among smokers of illicit cigarettes. The evidence also shows that a sizeable proportion of legal brand cigarettes were sold below the MLP. This study offers insight into what happened in circumstances in which a government failed to keep current with tax policies and the monitoring of domestic manufacturing. Brazil has been a world leader in the monitoring of the tobacco epidemic, and this study also offers an innovative use of data that an increasing number of countries are collecting.

## INTRODUCTION

Among the numerous antismoking legislative and regulatory measures implemented in Brazil in the last decades,<sup>1,2</sup> the tax reform introduced in 2011 significantly contributed to reducing tobacco consumption in the country.<sup>1,3,4</sup> It was composed of two specific rates and one small ad valorem component, which would be increased annually over expected inflation rates; moreover, the reform gave the Executive Branch authority to set a minimum price for a pack of cigarettes, which would be also increased every year over expected inflation rates.<sup>3,4</sup>

There is ample evidence that increases in tobacco taxes reduce affordability and tobacco consumption.<sup>5,6</sup> However, since 2017, Brazil has not increased either specific excise tax rates or the minimum cigarette price established by law, thus resulting in a sustained reduction in the real average price of a 20-pack of cigarettes manufactured by

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The lack of adjustment in tobacco taxes and the minimum legal price (MLP) has led to a sustained decrease in real prices of cigarettes manufactured by companies legally registered in Brazil.

## WHAT THIS STUDY ADDS

⇒ Around 14% of Brazil's cigarette production by registered producers is likely not paying taxes, and a large number of illicit brand cigarettes were also sold at or above MLP (>25%).  
⇒ The cigarette marketplace has shifted from one where legal brands were typically considerably more expensive than illicit cigarettes to a more complex dynamic.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Current tax and minimum price policies, and contextual social factors likely contributed to the presence of a 'higher-priced' illicit brand market.  
⇒ Countries that may face similar or related challenges in understanding the complexities of their illicit tobacco marketplaces could innovate and consider this type of survey data based on a combination of brand and price.

companies legally registered in the country. Using 2013 prices as the base, it increased from R\$ 4.3 in 2011 to R\$ 5.9 in 2017 and then decreased for 5 consecutive years to R\$ 5.2 in 2022.<sup>7,8</sup>

In Brazil, independent researchers have consistently analysed high-quality government serial cross-sectional surveys to cross-validate estimates of the size of the illicit market over time.<sup>9-11</sup> Evidence across many countries indicates that the industry consistently overestimates this illicit trade to argue in a simple and direct way that increases in taxes and/or prices lead to increases in the size of the illicit cigarette market.<sup>12-15</sup> This alleged consequence of tax policy—almost always misleadingly represented and/or poorly substantiated—ends up interfering with the decision of government authorities to continue promoting tax rate and/or minimum price increases, as happened in Brazil.<sup>4,16</sup> For this reason, it is recommended that actions to monitor the consumption of illicit tobacco products should be implemented with tax measures.<sup>15,17,18</sup>

In accordance with provisions in Article 20 of the WHO Framework on Tobacco Control (FCTC), to which Brazil is a Party,<sup>17</sup> Brazil implemented a sustained and integrated nationwide monitoring



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system to track the tobacco epidemic over time. This system comprises broader national surveys conducted among adolescents or adults who provide information on morbidity and risk behaviours for non-communicable diseases, as well as official government data on cigarette production and macroeconomic indicators.<sup>7 19–24</sup>

Accordingly, a nationally representative survey conducted in 2019<sup>22</sup> collected for the first time in Brazil information on both self-reported brand names and prices paid by smokers in their last purchase. These data points allow us to explore detailed new evidence on illicit practices, such as selling legal brands below the minimum legal price (MLP), as well as illicit brands sold for at least the MLP. Examining these dynamics also helps to estimate ‘overall-illicit’ cigarette consumption in the country. Brazil has been a world leader in the monitoring of the tobacco epidemic, and our study provides an opportunity for other countries that may face similar or related challenges in the future to innovate and consider generating and/or using this type of survey data.

## METHODS

This study uses the National Health Survey (PNS) conducted in 2019.<sup>22</sup> The tobacco-behavioural questions in this nationally representative cross-sectional survey were based on selected questions that are part of the Global Adult Tobacco Survey (GATS), a component of the ongoing Global Tobacco Surveillance System established by the WHO (GTSS/WHO) to track the evolution of the tobacco epidemic.<sup>20</sup> A stratified and weighted probabilistic sample with four selection stages (municipalities, census tracts, households and individuals aged 15 years and older) was used. Only one individual per household (n=90 846) was randomly selected to answer questions about tobacco use, and 11 386 individuals reported that they were currently smoking. Detailed methods for the PNS survey have been published elsewhere.<sup>22</sup>

For the first time in the country, the Brazilian Geography and Statistics Institute (IBGE), which designed the survey, collected information on cigarette brand names in smokers’ last purchase. However, in the final database, the disclosure of the micro-data with the names of the brands was forbidden. So, before its release to the public, brands were dichotomized into legal (brand-legal) and illicit (brand-illicit) packs by using the list of the brands approved on the Brazilian market by the Health Regulatory Agency (ANVISA).<sup>25</sup> An increasing number of countries are also collecting brand data in their tobacco surveillance systems, for example, through new GATS efforts, which should help with similar analyses in other countries.<sup>26</sup>

By combining two questions ‘The last time you bought manufactured cigarettes for yourself, how many cigarettes did you buy?’ and ‘In total, how much money did you pay for this purchase?’, we were able to estimate the price paid per pack of 20 cigarettes. To establish a boundary between legal brands sold with discount and legal brands that did not pay taxes (domestic tax evasion), we defined a ‘threshold price’ (TP) based on the R\$ 5.00 minimum price established by law (MLP) multiplied by the relative difference between the average price per pack paid by smokers of legal cigarettes who bought more than one pack in their last purchase and the average price paid by those who bought only one pack (–10%, based on preliminary PNS database analysis).<sup>11</sup> Thus, legal brands approved by ANVISA<sup>25</sup> (brand-legal) that were sold below the TP, that is, below R\$ 4.5 per pack, were also added to the size of the illicit market (overall-illicit). Previous research found that the sum of the costs of production and distribution, the retail margins and the taxes that are supposed to be paid for these legal brands was very close

to MLP.<sup>4 9</sup> Thus, if we assume that firms cannot simply stop paying the non-tax components, then most of ‘brand-legal’ sold below TP (or MLP) were somehow introduced on the market without paying taxes. The crux is that these are either publicly traded companies (in this case, largely British American Tobacco holding 80% of the cigarette market share in 2018)<sup>27</sup> which have to be responsive to shareholders or small companies that lack the kind of capital to sustain a price discounting strategy widely and deeply. Among users of manufactured cigarettes (9.9% of the Brazilian population), individuals who reported having bought single sticks were excluded from the analysis (around 4% of them) because it was impossible to define a valid criterion for the cut-off price point.

Information on daily manufactured cigarette consumption was based on two questions: (1) ‘Currently, do you smoke?’, categorised as ‘daily’, ‘less than daily’ or ‘not at all’, and if ‘daily’ or ‘less than daily’, (2) ‘On average, how many manufactured cigarettes do you smoke per day (OR per week)?’. We divided the total number of cigarettes smoked per week by seven to obtain their daily consumption.

We grouped the 26 Brazilian states and the Federal District into eight geographical regions (selected regions) to better understand the modus operandi for the supply of illicit tobacco products, including potential smuggling routes and/or variation in destinations for domestically produced illicit cigarettes. The regions are the following: ‘north of the land border with Paraguay (*Acre, Rondônia, and Mato Grosso*)’, ‘land border with Paraguay (*Mato Grosso do Sul and Paraná*)’, ‘south of the land border with Paraguay (*Santa Catarina and Rio Grande do Sul*)’, ‘north (*Amazonas, Roraima, Amapá, Pará, and Tocantins*)’, ‘northeast with coastline (*Maranhão, Ceará, Rio Grande do Norte, Pernambuco, Paraíba, Alagoas, Sergipe, and Bahia*)’, ‘northeast without coastline (*Piauí*)’, ‘southeast (*Minas Gerais, Espírito Santo, Rio de Janeiro, and São Paulo*)’ and ‘central-west (*Goiás and Distrito Federal*)’ (see figure 1) based on (1) recently published research that assessed the distribution of illicit cigarette consumption in selected Brazilian states or cities,<sup>9 11 26</sup> (2) the fact that Paraguay is the overwhelming main source of illicit cigarettes to Brazil<sup>4 9 11 28–31</sup> and (3) preliminary PNS database analysis.

## Data analysis

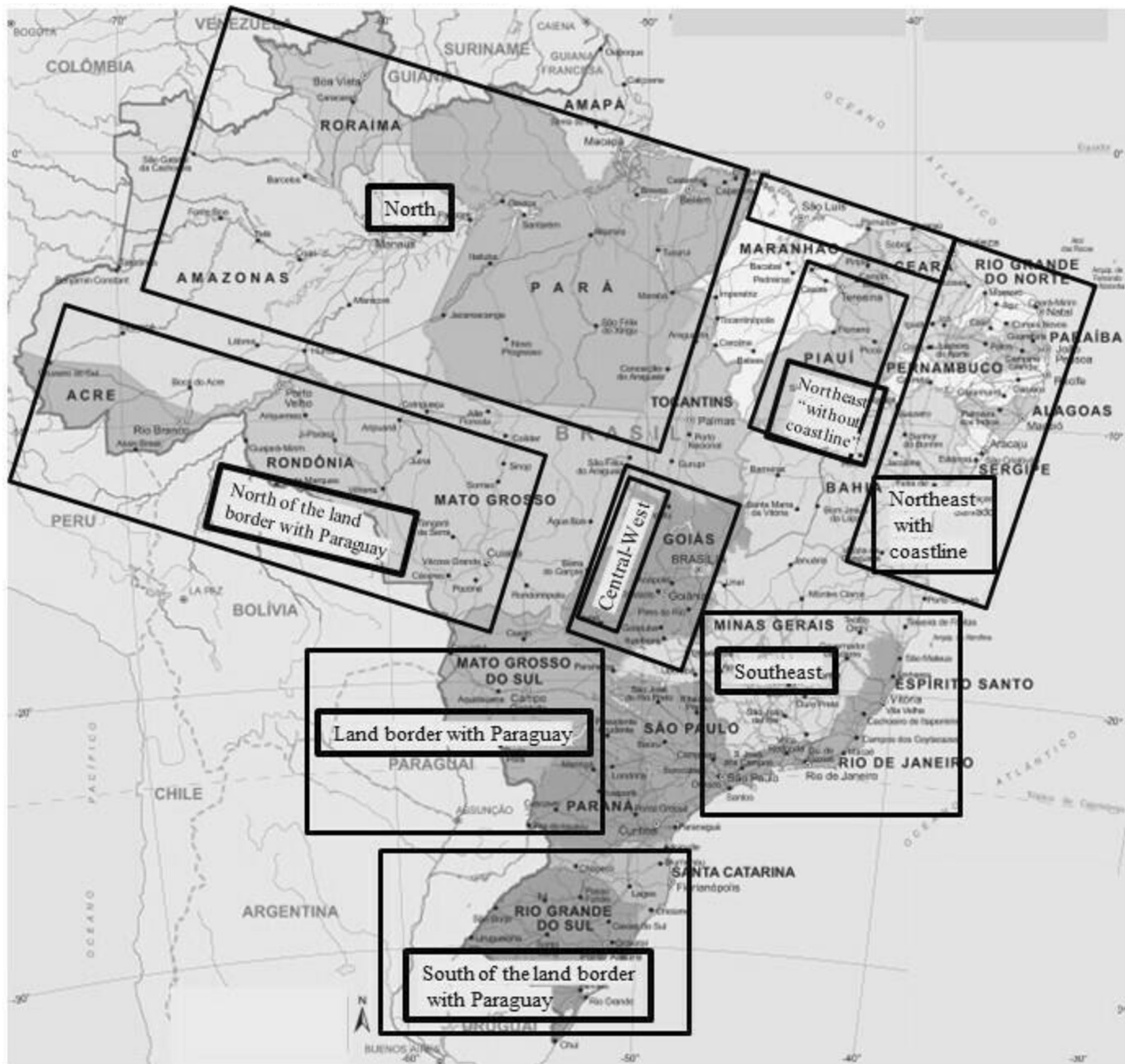
All estimates were weighted by average daily cigarette consumption. We estimated the proportion of ‘brand-illicit’ and ‘overall-illicit’ cigarette consumption, and respective 95% CI, overall and by selected regions. We also estimated the proportion of illicit brand cigarettes sold at or above MLP among ‘brand-illicit’, and the proportion of legal brand cigarettes sold below TP among ‘brand-legal’.

We estimated the distribution of average and median computed prices in Reais (R\$), and respective 95% CI, for ‘brand-illicit’ sold below MLP, ‘brand-illicit’ sold at or above MLP, ‘brand-legal’ sold below TP, ‘overall-illicit’ and ‘brand-legal’ sold at or above TP, overall and by ‘selected regions’.

STATA V.15.0 was used to account for the complex sample weights.<sup>32</sup>

## RESULTS

Table 1 shows that the proportions of ‘brand-illicit’ and ‘overall-illicit’ cigarette consumption were estimated at, respectively, 38.6% and 47.1% in 2019. Moreover, around one-quarter of illicit brand cigarettes were sold for at least the MLP, and 13.8% of legal brand cigarettes were sold below the R\$ 4.5 TP. Brazilian



**Figure 1** Selected regions of Brazil.

states located on the land border with Paraguay, in the north of the land border with Paraguay or in the northeast without coastline presented the highest proportion point estimates of foreign brand cigarettes smuggled into Brazil and/or produced in illegal factories (64.1%, 58.6%, and 64.3%, respectively). The two states located on the land border with Paraguay also presented the lowest proportions of illicit brand cigarettes sold at or above the R\$ 5.00 MLP (12.7%) and legal brand cigarettes sold below TP (3.8%). Brazilian states located in the northeast of Brazil (with or without coastline) presented the highest proportions of legal brand cigarettes sold below TP (22.8% and 18.6%, respectively).

Table 2 shows that the average computed price for a pack of 20 cigarettes in Brazil, including both legal and illicit brands, was R\$ 5.68 in 2019. The average price for a pack of a legal brand sold at or above TP was approximately 90% higher than the

average price paid for a pack of ‘overall-illicit’ (R\$ 7.37 vs R\$ 3.79). Brazilian states located on the land border with Paraguay presented the lowest average price (point) estimates for illicit brands sold below MLP (R\$ 3.17) and also the highest average price (point) estimates for legal brands sold at or above TP (R\$ 7.87).

The average price for illicit brands sold at or above MLP was very close to R\$ 5.00 (the average price for the whole country was R\$ 5.18), and the average price for legal brands sold below TP was considerably below the R\$ 5.00 MLP (the average price for the whole country was R\$ 3.22) (table 2). These patterns were quite similar across selected regions. Figure 2A,B show the whole distribution of prices for illicit and legal brand names and indicate that the medians and the means differed by less than 10%. Online supplemental figures 1a-1p show the same information by ‘selected regions’, with also small differences between medians and means.

**Table 1** Proportion of illicit cigarette consumption by selected region and condition—Brazil, 2019

Region	Condition (brand × price)				
	Illicit		Legal		% Overall illicit (A+C*D)
	% Illicit among all brands* (A)	% Sold ≥R\$ 5.0† among illicit brands (B)	% Legal among all brands* (C)	% Sold <R\$ 4.5‡ among legal brands (D)	
Brazil	38.6 (35.8–41.5)	26.1	61.4 (58.5–64.2)	13.8	47.1 (44.2–49.9)
North of the land border with Paraguay‡	58.6 (49.7–66.9)	59.8	41.4 (33.1–50.3)	7.1	61.5 (53.1–69.3)
Land border with Paraguay§	64.1 (57.5–70.3)	12.7	35.9 (29.7–42.6)	3.8	65.5 (58.8–71.6)
South of the land border with Paraguay¶	27.7 (23.0–33.0)	21.1	72.3 (67.0–77.0)	12.5	36.7 (31.9–41.9)
North**	24.6 (17.9–32.9)	63.5	75.4 (67.1–82.1)	15.2	36.1 (28.2–44.9)
Northeast with coastline††	36.3 (31.4–41.4)	31.4	63.7 (58.6–68.6)	22.8	50.8 (45.9–55.6)
Northeast 'without coastline'‡‡	64.3 (51.1–75.6)	23.4	35.7 (24.4–49.0)	18.6	70.9 (58.3–80.9)
Southeast§§	37.1 (32.6–41.9)	27.2	62.9 (58.1–67.4)	13.5	45.6 (40.9–50.4)
Central-West¶¶	36.6 (28.2–45.8)	22.9	63.4 (54.2–71.8)	7.9	41.6 (32.8–50.9)

All estimates are weighted by average daily cigarette consumption.  
 \*Based on brands approved on the Brazilian market by ANVISA ('brand-illicit' vs 'brand-legal').  
 †Based on the price per pack paid by smokers in their last purchase.  
 ‡Acre, Rondônia and Mato Grosso.  
 §Mato Grosso do Sul and Paraná.  
 ¶Santa Catarina and Rio Grande do Sul.  
 \*\*Amazonas, Roraima, Amapá, Pará and Tocantins.  
 ††Maranhão, Ceará, Rio Grande do Norte, Pernambuco, Paraíba, Alagoas, Sergipe and Bahia.  
 ‡‡Piauí.  
 §§Minas Gerais, Espírito Santo, Rio de Janeiro and São Paulo.  
 ¶¶Goiás and Distrito Federal.

## DISCUSSION

'Overall-illicit' cigarette consumption was estimated at 47.1%, and the average price paid per pack of 20 illicit cigarettes was estimated at R\$ 3.79 in Brazil in 2019. Around 14% of Brazil's cigarette production by registered producers is likely not paying taxes, and a large number of illicit brand cigarettes were also sold at or above MLP (>25%). Because illicit tobacco products

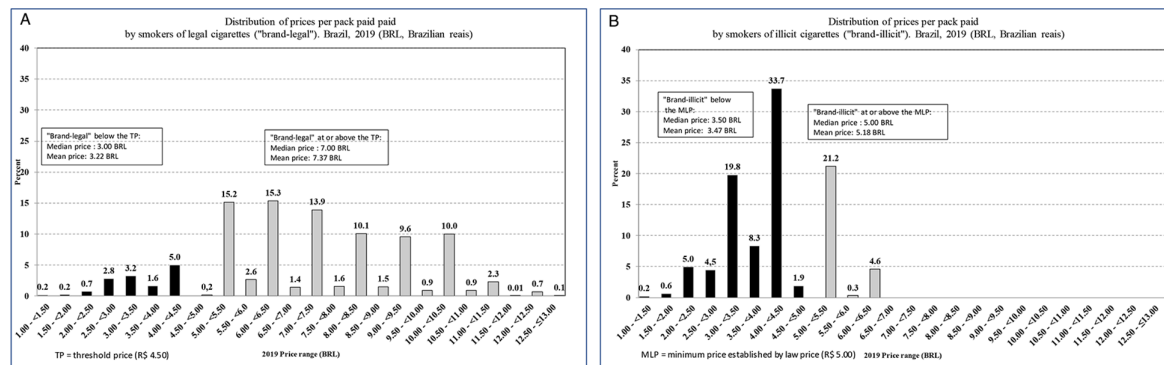
are often less expensive, they likely undermine efforts to prevent smoking initiation and encourage smoking cessation, especially among lower-income individuals.<sup>5 9 15</sup> Low- and middle-income countries, such as Brazil, cannot afford the health, social and economic consequences of tobacco use.<sup>33</sup>

Recently published papers have shown that illicit cigarette prices generally follow the prices of legal cigarettes.<sup>9 34</sup> Globally,

**Table 2** Distribution of average computed prices (Reais, R\$) for illicit, legal and 'all' pack of cigarettes\* by selected region and condition—Brazil, 2019

Region	Condition (brand × price)†‡					
	Illicit		Legal		'Overall-illicit' (A+B+C)	All packs (A+B+C+D)
	Illicit brand sold <R\$ 5.0 (A)	Illicit brand sold ≥R\$ 5.0 (B)	Legal brand sold <R\$ 4.5 (C)	Legal brand sold ≥R\$ 4.5 (D)		
Brazil	3.47 (3.40–3.53)	5.18 (5.12–5.24)	3.22 (3.06–3.39)	3.79 (3.70–3.88)	7.37 (7.25–7.48)	5.68 (5.55–5.82)
North of the land border with Paraguay§	3.49 (3.29–3.69)	5.33 (5.20–5.46)	3.62 (3.18–4.05)	4.54 (4.26–4.82)	7.69 (7.09–8.28)	5.75 (5.33–6.17)
Land border with Paraguay¶	3.17 (3.03–3.30)	5.26 (5.08–5.43)	2.76 (2.25–3.27)	3.42 (3.24–3.60)	7.87 (7.48–8.27)	4.96 (4.63–5.28)
South of the land border with Paraguay**	3.41 (3.27–3.54)	5.14 (5.01–5.26)	3.33 (3.01–3.66)	3.66 (3.50–3.83)	7.19 (6.98–7.39)	5.89 (5.66–6.13)
North††	3.75 (3.57–3.93)	5.20 (5.05–5.34)	3.08 (2.13–4.03)	4.16 (3.66–4.66)	7.84 (7.34–8.33)	6.51 (5.99–7.03)
Northeast with coastline‡‡	3.57 (3.44–3.68)	5.22 (5.04–5.41)	3.49 (3.32–3.67)	3.92 (3.76–4.07)	6.87 (6.67–7.06)	5.37 (5.19–5.55)
Northeast 'without coastline'§§	3.72 (3.44–4.00)	5.20 (5.02–5.37)	3.45 (3.01–3.88)	4.01 (3.73–4.28)	7.67 (6.86–8.47)	5.07 (4.50–5.64)
Southeast¶¶	3.53 (3.43–3.64)	5.15 (5.07–5.24)	3.13 (2.89–3.37)	3.82 (3.67–3.97)	7.50 (7.32–7.67)	5.82 (5.59–6.05)
Central-West***	3.73 (3.53–3.92)	5.09 (5.01–5.17)	2.68 (1.83–3.54)	3.88 (3.60–4.15)	6.65 (6.27–7.04)	5.50 (5.19–5.81)

All estimates are weighted by average daily cigarette consumption. Reais=US\$0.254 in 2019.  
 \*Pack of 20 cigarettes.  
 †Based on brands approved on the Brazilian market by ANVISA.  
 ‡Based on the price per pack paid by smokers in their last purchase.  
 §Acre, Rondônia and Mato Grosso.  
 ¶Mato Grosso do Sul and Paraná.  
 \*\*Santa Catarina and Rio Grande do Sul.  
 ††Amazonas, Roraima, Amapá, Pará and Tocantins.  
 ‡‡Maranhão, Ceará, Rio Grande do Norte, Pernambuco, Paraíba, Alagoas, Sergipe and Bahia.  
 §§Piauí.  
 ¶¶Minas Gerais, Espírito Santo, Rio de Janeiro and São Paulo.  
 \*\*\*Goiás and Distrito Federal.



**Figure 2** Distribution of prices per pack paid by smokers by 'brand-illicit status'. Brazil, 2019.

it is rather rare that illicit cigarettes are predominantly higher-priced than domestic legal ones.<sup>34</sup> Though most countries probably have some smuggled premium cigarettes,<sup>35 36</sup> the marketplace is almost always dominated by lower-priced brands. In Brazil, the price of illicit cigarettes may have increased in the past due to sharp increases in the real price of legal cigarettes between 2011 and 2017.<sup>7 8</sup> More recently, there has been a lack of adjustment in tobacco taxes and the MLP for inflation and income growth, thus resulting in an increase in cigarette affordability (eg, the number of cigarette packs sold at the MLP that an average wage can buy in a month increased from 418.9 in 2017 to 459.8 in 2019).<sup>16 29</sup> The presence on the market of a segment of 'higher-priced' illicit brands—that is, illicit brands sold at or above an MLP that has not changed since 2017—also suggests patterns of illicit brand loyalty and/or perceived "brand quality" among smokers of illicit cigarettes. Furthermore, the demand for illicit cigarettes in Brazil, either for illicit brands or legal brands sold below the TP, may have other contextual determinants, such as weak law enforcement and a culture of purchasing illicit products that should be further explored in future qualitative and quantitative studies.<sup>4 5 15 37–39</sup>

With the freezing of MLP and tax rates—that is, lower prices (and greater affordability) and therefore less incentive to smuggle—we have seen as expected a sustained decreasing trend in the proportion of illicit cigarette consumption smuggled into Brazil between 2016 and 2019 (from 42.8% to 38.6%).<sup>10 16</sup> Nevertheless, Brazil continues to have one of the highest proportions of 'brand-illicit' cigarette consumption in the world.<sup>9–11 15 40</sup> Moreover, when we add domestic tax evasion (overall-illicit), the numbers get even higher. Still, the tobacco industry overestimates 'overall-illicit' cigarette consumption to claim that evidence-based tobacco control measures will likely result in an increased illicit market. In fact, a recent estimate generated from an official data source—the 2019 PNS—was almost 10 percentage points lower than the concurrent estimate provided by the tobacco industry<sup>16 41</sup> (see also online supplemental table 1 for estimates of the illicit market by Brazilian states and source of information). Furthermore, the tobacco industry continues to pressure the Brazilian government to assess the 'pertinence and relevance' of further reducing tobacco taxes,<sup>42</sup> even though, according to the WHO's Eighth Report on the Global Tobacco Epidemic launched in July 2021,<sup>43</sup> Brazil has the second cheapest most-sold legal brand in the Region of the Americas. Not surprisingly, the latest Global Tobacco Industry Interference Index shows that Brazil is failing to protect its tobacco control policies from industry interference.<sup>44</sup>

The relative difference between prices in the legal and the illicit markets in 2019 was quite similar to that found in 2008

when tax policy was weak,<sup>4 9</sup> and much lower than that found in 2013 when Brazil was experiencing sharp increases in cigarette prices above inflation and income growth (see online supplemental table 2).<sup>3 4 9</sup> Moreover, much of the recent decline in smoking prevalence occurred during the time of the strongest tax policy.<sup>1 3 4</sup> It goes almost without saying that Brazil should promote regular increases in cigarette taxes and minimum prices to achieve health and fiscal policy objectives. At the same time, the government should fully implement Article 15 of the FCTC and the Protocol to Eliminate Illicit Trade in Tobacco Products, to which it is also a Party.<sup>17</sup> The high proportion of illicit cigarette consumption in states with a land border with Paraguay suggests there remains a large supply of illicit cigarettes at low cost and reinforces the need to strengthen international cooperation with Paraguay. Moreover, the high proportion of 'overall-illicit' in the north of the land border with Paraguay and/or northeast suggests that smugglers may be adapting their illicit practices to take advantage of weak law enforcement and little commitment to controlling the supply chain in these regions.<sup>23 39</sup>

In Brazil, since 2007, there has been a system of unique identification on each pack of cigarettes (Scorpios) that imposes several obligations on cigarette manufacturers such as to install equipment to count output, as well as devices to control, register, record and transmit information about the quantity of cigarettes manufactured.<sup>9 24</sup> However, future research should explore the possible weaknesses of Brazil's tracking and tracing system, such as the lack of licenses and movement control related to the supply of manufacturing equipment and raw tobacco, poorly controlled tax debts of producers and the presence of illegal factories, that may contribute to the number of legal brands sold below TP.<sup>45</sup> In fact, official data on collected revenues amount to less than the tax per pack expected at the average price multiplied by registered production quantity.<sup>24 29</sup> Particularly in Brazilian states distant from the border with Paraguay, tax evasion by domestic producers seems to be more relevant.

## LIMITATIONS

Biases may have resulted from self-reporting tobacco behaviours in the survey.

Given the cross-sectional nature of our current study, it is impossible to infer causality from the findings.

We were not able to use direct observation of the packs to distinguish legal and illicit packs.<sup>11 25 28 30 46</sup> As a consequence, we could not fully assess the presence of counterfeit cigarettes of domestic origin. However, previous studies conducted in selected Brazilian cities based on the systematic inspection of packs by experts in tobacco control found that 100% of 'brand-legal'

packs had all required attributes (eg, health warning approved on the Brazilian market by the Health Regulatory Agency) suggesting strongly that counterfeiting of legal brands is exceptionally rare.<sup>11 28 30</sup> Unfortunately, information about the pack's unique identifying number or the presence of tax stamp itself could not be used for illicit cigarette pack identification as the unique pack identifiers are often torn and destroyed when a smoker opens their pack.

Finally, it was impossible to distinguish between domestic federal tax evasion and other different types of illicit practices, such as price discounting or legal cigarettes being stolen during transportation. However, the fact that the average price of 'brand-legal' sold below TP was around 35% lower than MLP and 7% lower than the price of all 'brand-illicit' sold below MLP suggests that price discounting is unlikely to be a large-scale marketing strategy implemented by tobacco companies in Brazil because it would be unsustainable as a longer-term business practice, but land transport security may be an issue for some Brazilian regions.

## CONCLUSIONS

The lack of updating existing excise tax rates and minimum price policies, and contextual factors such as perception of illicit brand quality and social acceptance of illicit trade, likely contributed to the presence of a 'higher-priced' illicit-brand market. The evidence also shows that a sizeable proportion of legal brand cigarettes were sold below the MLP. Although this research focused primarily on the Brazilian context, the issues raised are likely to be useful for other countries that may face similar or related challenges in understanding the complexities of their illicit tobacco marketplaces. This study also offers an example of an innovative use of data that an increasing number of countries are already collecting or may collect in the future.

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**Competing interests** None declared.

**Ethics approval** The study followed the guidelines of Resolution No. 466/2012 of the National Health Council, which deals with research involving human beings. The National Health Survey database is available for public access and use, and the National Health Survey was approved by the National Research Ethics Committee of the Ministry of Health, under Report No 3.529.376 (2019). The National Health Survey was carried out with the cooperation of the Ministry of Health and the Brazilian Geographic and Statistics Institute (IBGE). The IBGE complies with the norms proposed by the United Nations Statistics Commission, abiding by the principles of impartiality, equal access, maintenance of professional and ethical standards, responsibility and transparency, prevention against data misuse, efficiency and confidentiality. For this reason, the IBGE is not obliged to obtain Informed Consent from the individuals interviewed.

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