**Title**: **The** **Illicit Cigarette Trade in the Cities of Pakistan: Comparing Findings between the Consumer and Waste Recycle Store Surveys**

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# Abstract

*Background*

Concerns about the magnitude of illicit cigarette trade have prevented the Government of Pakistan from increasing tobacco taxes. We estimated the proportion of illicit cigarettes sold in Pakistani cities. Moreover, we compared two methods for collecting cigarette packs and investigated if the illicit cigarette trade equates to tax evasion.

*Method*

We analysed cigarette packs collected from 10 cities of Pakistan using two methods: consumer survey based on a two-stage random sampling strategy to recruit adult smokers and photograph their cigarette packs; and waste recycle store survey to purchase used cigarette packs. Cigarettes were considered illicit if any one of the following were absent from their packs: text and pictorial health warning, underage sale prohibition warning, retail price and manufacturer’s name. From the consumer survey, we also estimated the proportion of smokers that purchased loose cigarettes (illegal) and packs below the minimum retail price. Taxation officers (n=4) were consulted to assess their level of confidence in judging tax evasion using the above criteria.

*Results*

Out of 2,416 cigarette packs in the consumer survey, 454 (17.8%; 95%CI: 15.4-20.2%) were illicit. Similarly, out of 6,213 packs from waste recycle shops, 1,046 (16.8%; 95%CI: 15.9-17.7%) were illicit; the difference was not statistically significant (p=0.473). Among consumers, 29.5% bought loose cigarettes and 13.8% paid less than the minimum retail price. The taxation officers considered the manufacturer’s name and retail price on cigarette packs as the most relevant criteria to detect tax evasion.

*Conclusions*

One in six cigarette packs consumed in Pakistan could be illicit. These figures are far less than those propagated by the tobacco industry. Collecting packs from waste recycle stores is an efficient and valid method to estimate illicit cigarette trade.

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# Introduction

Tobacco use is responsible for one in six deaths from non-communicable disease (NCDs) and is the only risk factor associated with all of the four most common NCDs - cardiovascular disease, cancer, chronic lung disease and diabetes.[[1]](https://paperpile.com/c/GP8QqD/gUvGL) The global number of deaths caused by tobacco exceeds that attributable to HIV, tuberculosis and malaria combined.[[2]](https://paperpile.com/c/GP8QqD/wIUWG) With 24 million adults using tobacco products [[3]](https://paperpile.com/c/GP8QqD/niu5z) and more than 160,100 tobacco-related deaths every year,[[2]](https://paperpile.com/c/GP8QqD/wIUWG) Pakistan is among the 15 countries with the highest tobacco burden.[[2–4]](https://paperpile.com/c/GP8QqD/wIUWG+DyM7O+niu5z) Tobacco consumption prevalence was 19.1% (12.4% use cigarettes, 7.7% use smokeless tobacco) among adults in 2014; and is highly gendered with men having significantly higher smoking prevalence than women; 31.8% compared with 5.8%, respectively.[[3]](https://paperpile.com/c/GP8QqD/niu5z)

In 2005, Pakistan signed the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) and in 2018, ratified the FCTC Protocol to Eliminate Illicit Trade in Tobacco Products. The WHO FCTC suggests tobacco price and taxation as the most effective policy instrument to control tobacco consumption. In Pakistan, tobacco excise tax -the largest source of revenue from the tobacco sector- is based on a two-tier structure of specific taxes on the range of retail prices for higher (63.4%) and lower (42.6%) cost brands.[[5]](https://paperpile.com/c/GP8QqD/uR1cG) Overall, tobacco excise tax is approximately 53% of the retail cigarette price (average across all higher and low-cost brands), which is well below the WHO’s minimum recommended level of 70%; therefore, the price of cigarettes in Pakistan remains one of the lowest in the world.[[6]](https://paperpile.com/c/GP8QqD/bOTE2) The minimum retail price set by the government for a low-cost brand 20-cigarette pack in 2017 was only 47.38 Pakistan Rupees (PKR) (0.45 USD),[[7]](https://paperpile.com/c/GP8QqD/1jQk) which was raised in 2019, to just 62.75 PKR (0.41 USD).[[8]](https://paperpile.com/c/GP8QqD/gz0GD)

The illicit tobacco trade (any practice that relates to tobacco production, shipment, receipt, possession, distribution, sale or purchase prohibited by law) and tax evasion (Illegal activities to pay less tax or no taxes)[[9]](https://paperpile.com/c/GP8QqD/4vFCP) increases tobacco consumption and tobacco-related deaths.[[10,11]](https://paperpile.com/c/GP8QqD/FBgV1+n3Bkx) With the global share of the illicit trade in cigarette consumption being 16.8% for low- and middle-income countries (LMIC’s),[[11]](https://paperpile.com/c/GP8QqD/n3Bkx) significant revenue losses occur to these economies. Estimates of the extent of the illicit trade in Pakistan vary and are overinflated by the Tobacco Industry (TI). For example, the Pakistan Tobacco Company (PTC), an affiliate of British American Tobacco, reported the illicit trade share to be 39.4% and 40.7% in the second-half of 2016 and first-half of 2017, respectively.[[7]](https://paperpile.com/c/GP8QqD/1jQk) More recently the Euro Monitor International (EMI) estimated the extent of the illicit trade in Pakistan between 2012-2017 to be 22% to 37%.[[7]](https://paperpile.com/c/GP8QqD/1jQk) A similar estimate came from the International Tax and Investment Centre (ITIC) and its partner Oxford Economics (OE) which gave an estimate of 25%-42% for the period between 2012 and 2017.[[7,12]](https://paperpile.com/c/GP8QqD/KyHOX+1jQk) However, the validity of these estimates is questionable - EMI did not disclose its data sources or methods to calculate the illicit cigarette sales and the credibility of the ITIC-OE report is also questionable.[[13]](https://paperpile.com/c/GP8QqD/52fqu) The ITIC-OE estimates were produced through an Empty Pack Survey in which Philip Morris International was a “participating company” collecting these packs.

These opaque estimates of the illicit cigarette trade quoted by the TI and their constant interference in policymaking deter governments from imposing tobacco tax increases and thus lead to ineffectual tobacco control and a lost opportunity for the governments to collect more revenue. In the absence of robust and independent data on the extent of the illicit cigarette trade in Pakistan, the TI will continue to lobby the government not to increase cigarette taxes and predict a rise in the illicit trade should they do so. A recent motion to impose higher taxes on cigarettes in 2019 was blocked by the Federal Board of Revenue based on a fictitious industry ‘report’. This report (never made public) asserted that the illicit trade constitutes 41% of the cigarette market share and an increase in taxes will lead to more smuggling – a claim often made by the industry and constantly refuted by independent research in other countries.[[7, 9, 14–17]](https://paperpile.com/c/GP8QqD/N4w8o+4vFCP+wt1Yi+vO1ly+Jkl2+1jQk)

The illicit tobacco trade is considered a broader category than tax evasion; therefore, the criteria used to detect the illicit cigarette packs do not always equate to tax evasion. For example, the Government of Pakistan considers a cigarette pack illicit if it does not meet five criteria based on health and age warnings and manufacturer and price details. However, absence of any one of these criteria does not always mean that the tax has not been paid (personal communication Federal Board of Revenue, Pakistan).

In this paper, we provide independent estimates of the proportion of illicit cigarette packs consumed in the cities of Pakistan. We compare a new and more efficient method (waste recycle store survey) of collecting cigarette packs to detect the illicit trade against an established method (consumer survey). In the absence of tax stamps or a tracking and trace system in Pakistan, we also investigated the confidence with which the criteria for illicit cigarette packs can be used as a proxy for tax evasion.

# Methods

We conducted two surveys (consumer & waste recycle store) to collect and analyse representative samples of cigarette packs to estimate the market share of the illicit cigarette trade and a workshop to assess the level of confidence in judging tax evasion using the criteria for illicit cigarette packs. The consumer and the waste recycle store surveys were conducted between September 2019 and March 2020.

*Survey design*

The consumer survey was a cross-sectional face-to-face household survey conducted in the ten most populous cities of Pakistan representing 20% of the total population and 16% of all smokers in Pakistan. The second survey was of waste recycle stores in the same ten cities and within the same timeframe.

*Population and sampling strategy*

The methods for the consumer survey are described elsewhere;[[18]](https://paperpile.com/c/GP8QqD/wcmhF) Briefly, cigarette packs were collected from regular smokers aged 15 years or above that participated in the survey. A two-stage random sampling method was adopted. Within the ten cities, we selected 316 Union Councils (PSUs) using a stratified random sampling approach. Within PSUs, households with at least one regular smoker aged 15+ were eligible. We identified these households by assessing eligibility in every household within all 316 PSUs and from these, randomly selected 20 households per PSU with a total sample size of 6,313 households. Sample size estimation details are described elsewhere.[[18]](https://paperpile.com/c/GP8QqD/wcmhF) Only one participant was identified in each household using Kish Grid method.[[19]](https://paperpile.com/c/GP8QqD/gAy6b) All eligible households were offered written study information and selected participants consented prior to their recruitment.

The waste recycle store survey used a census-based approach. In each city, discarded cigarette packs are sold (by weight) in specified shops in a waste recycle market. Our field investigators visited these shops fortnightly during the survey period and purchased discarded cigarette packs from every shop selling such packs in all cities. A random sample of discarded cigarette packs, stratified by city and shop, was selected from these purchased packs; the sample size was kept the same as in the consumer survey. The number of packs per city were proportional to the population size (as above) but the number of packs per shop were equal.

*Data collection*

Following a three-day training, our field investigators (a quarter females and the rest males) conducted the two surveys and collected data using a pretested digital application CSPro 7.2 in password-protected tablets in real-time. In the consumer survey, the field investigators asked the participants to show them the cigarette packs and then returned these packs after photographing them. Cigarette packs collected in the waste recycle store survey were individually kept in zip-locked transparent plastic bags, labelled with a unique pack ID (city, waste recycle shop identifier, identification number), name of the brand and date of collection. Moreover, data on other cigarette pack details e.g. brand name; pack size; retail price inclusive of taxes printed on the pack and price paid (only in the consumer survey) were also collected. In the consumer survey, participants were also asked about their: socio-demographic and household characteristics; nicotine dependence and the strength of urges to smoke;[[20]](https://paperpile.com/c/GP8QqD/gg3f) their attitude (including the willingness to pay) towards cessation and previous quit attempts; use of cessation aids (including electronic cigarettes) and attitude towards tobacco control policies. All personal identifiable information was removed from the questionnaire and database.

*Pack analysis*

Each pack was examined for the five criteria of licit cigarette packs defined by the Government of Pakistan; absence of any one of these would render a cigarette pack illicit. These are: mandatory textual health warning (one side Urdu and one side English); graphic health warning; retail price printed on the pack; warning label that sales under 18 are prohibited; and name and country of the manufacturer. These criteria have been the legal requirements in Pakistan since 2015 or before. Compliance was checked against each of the five criteria and cigarette packs were labelled as illicit if any were not met. Based on the consumer survey, we also estimated the proportion of cigarette packs bought below 63 PKR per pack -the minimum retail price fixed by the government in the 2019 budget.

*Statistical Analysis*

Based on the consumer survey, we compared smokers’ characteristics between those using the licit and illicit packs. For both the consumer and waste recycle store surveys, the proportions of illicit cigarette packs were estimated for each city. For the consumer survey, the estimates were weighted taking the sampling design into consideration. The overall estimates were compared between the two surveys to detect any statistically significant difference using adjusted Wald F-Test in Stata (version 16.0) software.[[21]](https://paperpile.com/c/GP8QqD/ks1z)

*Workshop*

A workshop with excise taxation officers was conducted. The purpose was to understand the extent to which the illicit criteria play a part in the identification of cigarette packs as tax paid/not paid and to rank these criteria on the level of confidence the inspectors have in using these as a proxy for tax evasion. The participants included two field inspectors, one field supervisor and the director of the excise taxation department. The discussion, facilitated by the lead investigator (AK), coveredthe current procedure of administering and monitoring tobacco taxation, the definition of illicit from the excise taxation department perspective, how the illicit trade criteria are used to verify if tax has been paid and how counterfeit packs are identified. At the end, polling was conducted to determine a hierarchy among the criteria for illicit cigarette packs based on their perceived utility to detect tax evasion.

# Results

In the consumer survey, 97,345 households were approached and 12,127 of these were eligible. Among all eligible households, 7,225 were randomly selected; of these, 6,014 (83.3%) smokers, one per household, were available and agreed to participate in the survey. The participants were predominantly male (98.5%). Out of everyone who participated in the survey, 2416 (40.2%) were able to show their cigarette packs, which were photographed and then returned. During the waste recycle store survey, we purchased 17,409 discarded packs from the waste recycle shops, out of which 6,213 packs were randomly selected, keeping the city-wise distribution similar to the participants in the consumer survey (Table 1). In total, 8,629 cigarette packs (2,416 from consumers and 6,213 from waste recycle stores) were analysed.

Out of 2,416 cigarette packs collected in the consumer survey, 454 (17.8%; 95%CI: 15.4, 20.2) were identified as illicit: 350 (13.4%; 95%CI: 11.4, 15.4) had no pictorial health warning; 158 (5.8%; 95%CI: 4.7, 7.1) had no price written on the pack; 143 (5%; 95%CI: 3.9, 6.1) had no textual health warning; 420 (17.9; 95%CI:16.0, 19.8) had no underage sale prohibition warning and 34 packs (1.3%; 95%CI:0.74, 1.88) had no manufacturer name or country of origin as shown in figure 1. Out of the illicit packs identified, 53% violated only one criterion as shown in figure 2.

Consumers who bought the illicit cigarette packs were older than those who bought licit; otherwise the two groups were similar (Table 2).

Among all packs collected from consumers, we found that 364 (13.8%) packs were purchased at a price less than Rs. 63 -the minimum retail price set by the government. Out of 364 packs bought for less than the minimum retail price, 210 (58%) were identified as illicit according to the illicit cigarette pack criteria. On the other hand, over one in ten (11.3%, n=244) of the 2,052 packs that were bought for or above 63 PKR were considered as the illicit cigarette packs.

Among the 3,598 participants who could not show their cigarette packs: 1,844 (29.5%) bought loose cigarettes, 1,644 (27.9%) discarded their empty cigarette packs just before the survey and 110 (1.8%) borrowed cigarettes from others. Respondents, who bought loose cigarettes tended to be younger, less educated and also less nicotine dependent than those who did not (Table 2).

Among the randomly selected 6,213 packs from waste recycle shops, 1,046 (16.8%; 95%CI: 15.9, 17.7) were identified as illicit; 693 (11.2%; 95%CI: 10.3, 11.9) had no pictorial health warning; 597 (9.6%; 95%CI: 8.8, 10.3) had no price written; 262 (4.2%; 95%CI: 3.7, 4.7) had no textual health warning; 863 (13.9%; 95%CI: 13.0, 14.7) had no underage sale prohibition warning written; and 183 (3.4%; 95%CI: 2.9, 3.9) packs had no written manufacturer name or country of origin as shown in figure 1. Out of the illicit packs identified, 34.6% violated four and 32.9% violated one criterion, as shown in figure 2.

Overall, the proportion of packs considered as illicit was slightly higher in those collected from the consumers than those from the waste recycle stores, however, the difference was not statistically significant (Table 3).

In the workshop, the excise and taxation officers were in agreement that the information on the manufacturer and price on the cigarette packs was the most relevant information to judge tax evasion. However, they also highlighted that even if all of the five criteria are met, tax can still be evaded via producing counterfeit products or toll manufacturing (TI provides raw material, but cigarettes are produced, packaged and distributed by third-party companies).

Among the illicit cigarette packs identified in the two surveys, we identified the top illicit brands; majority were local brands (see supplemental material).

# Discussion

Our study found that 17.8% (95%CI: 15.4, 20.2) of cigarette packs from consumer survey and 16.8% (95%CI:15.9, 17.7) of cigarette packs from waste recycle stores sold in the cities of Pakistan might be illicit. The proportion of the illicit packs varied considerably between cities. For example, most packs analysed in Quetta - a city bordering with Iran- were illicit. Apart from smuggling, counterfeit packs, domestic illegal brands and toll manufacturing have been suggested as the reasons for the illicit cigarette trade in Pakistan.[[7]](https://paperpile.com/c/GP8QqD/1jQk)

Our estimates are remarkably similar to the 16.8% figure based on the analysis of the market share of the illicit tobacco trade in low-income countries.[[11]](https://paperpile.com/c/GP8QqD/n3Bkx) Unsurprisingly, our estimates are considerably lower than the unverifiable figures quoted previously for Pakistan in various TI reports.[[7,12]](https://paperpile.com/c/GP8QqD/KyHOX+1jQk) One such report (never made public) asserted that the illicit trade constituted 41% of the cigarette market share and an increase in taxes will lead to more smuggling – a claim often made by the industry and constantly refuted by independent research in other countries.[[7,9,14–17]](https://paperpile.com/c/GP8QqD/N4w8o+4vFCP+wt1Yi+vO1ly+Jkl2+1jQk) The most recent, independent data came from Nayab et al[[22]](https://paperpile.com/c/GP8QqD/dYX9q) who reported, that due to 2017 changes in the excise rate on cigarettes (introduction of a lower third tier resulted in the shifting of value (major selling brands) brands from the second to the third tier) and the resultant increase in cigarette sales, the size of the illicit sector was significant but not as large as the one claimed by the tobacco companies. For example, research reported in 2018 by Human Development Foundation (HDF) and Pakistan National Heart Association (PANAH) found that the illicit cigarette sales were below 9% in Pakistan.

In the field of the illicit tobacco trade, finding such discrepancies between studies conducted by independent researchers and those supported by TI and their front groups is not surprising. In fact several studies found similar differences across the globe.[[14,23]](https://paperpile.com/c/GP8QqD/N4w8o+HXuiB) In Poland, the illicit tobacco trade figures (22.9%) based on the industry reports were higher by nearly a half than those estimated from a consumer survey (14.6%) and the data from discarded packs (15.6%).[[15]](https://paperpile.com/c/GP8QqD/wt1Yi) The difference between the independent and TI-backed estimates found in our study was closer to another study in Hong Kong; the investigators there found that the industry-funded estimates (35.9%) of the illicit cigarette trade were three times than those estimated independently (11.9%).[[24]](https://paperpile.com/c/GP8QqD/PjG4Y) In a study in five cities in Colombia, the illicit cigarette trade was found to be only 3.5%, far lower than the industry estimates.[[16]](https://paperpile.com/c/GP8QqD/vO1ly) In a systematic review of papers assessing industry-funded illicit trade tobacco data, 31 out of 35 studies found that the tobacco industry estimates were higher than those obtained independently.[[25]](https://paperpile.com/c/GP8QqD/2kNXW) The authors criticized the way industry-funded data were collected, analysed and presented resulting in inflated estimates and making these unreliable. The fundamental problem with such data was a lack of transparency and insufficient information rendering it impossible to replicate the methods.

As noted by Ross,[[26]](https://paperpile.com/c/GP8QqD/fQcHK) various methods to assess the percentage of the illicit tobacco trade have been used across different studies. Examples include: measuring the difference between consumption and tax paid sales, interviewing smokers, examination of littered cigarette packs and econometric modelling. We collected and analyzed packs from two sources one following an established method - collecting and analysing packs collected from the consumers and a new - collecting used cigarette packs from waste recycle stores. There was no significant difference between the findings obtained from the two methods. In fact, both methods found that the pictorial health and underage prohibition warnings were the two most common features missing among the illicit cigarette packs. However, the method that relied on collecting used cigarette packs from waste recycle stores was less resource intensive and less likely to have selection bias than the consumer survey.

Our study has limitations. First, it was limited to cigarettes in a country where tobacco products are diverse and smokeless tobacco is popular. However, tobacco control laws applicable to smokeless tobacco and waterpipe smoking lag behind those for cigarettes and there are no agreed criteria on what would be considered as an illicit product. Second, our data collected was also limited to urban centers. Smoking prevalence in rural Pakistan is high and there is anecdotal evidence that the illicit tobacco trade might be more rampant in villages and small towns than major cities. Future estimates need to sample cigarettes packs from rural as well as urban areas. Third, our study collected packs from only a very small number of women. The smoking prevalence among women in Pakistan is far lower than men; Moreover, there is a stigma associated with women smoking which may have precluded many to admit smoking and participate in our survey. However, our estimates based on packs collected from waste recycle stores were gender neutral and since they were no different than those collected from consumers, a selection bias on the basis of gender is unlikely. A potential selection bias might have also creeped as only a third of consumers were able to show us their cigarette packs. It is possible that we might have underestimated the proportion of illicit cigarette packs if those who did not show us the packs were more likely to purchase the illicit packs. However, the proximity of the estimates based on the consumer and the waste recycle store surveys means that this would not have been a major issue.

There are two other important findings in our study that have policy implications. We found that 13.8% of all cigarette packs in the consumer survey were purchased at a price less than the minimum retail price set by the government. While nearly two-thirds of these packs also met the illicit criteria, the rest did not. This implies that it is possible that a small proportion of cigarette packs sold in the market meets the legal criteria but still not pay taxes. The tax officers confirmed this notion. It is impossible for us to say if these packs were counterfeit, smuggled or older than the current legislation (minimum retail price of PKR 63 was introduced in the 2019 budget) and hence dumped in the market by the industry itself. We also found that 29.5% consumers were able to buy loose cigarettes, which is against the law. Given that this trend was more common among the youth, this finding is particularly worrying and calls for stricter law enforcement. In addition, effective policies to counteract tobacco smuggling and other kinds of illicit tobacco sales in line with the provisions of the FCTC Protocol to Eliminate Illicit Trade in Tobacco need to be implemented.

The opaque estimates of the illicit cigarette trade quoted by the TI and their constant interference in policymaking deter governments from imposing tobacco tax increases and thus lead to ineffectual tobacco control and a lost opportunity to collect more revenue. Previously, in the absence of robust and independent data on the extent of the illicit cigarette trade in Pakistan, the TI continued to lobby the government not to increase cigarette taxes, through scare tactics about a potential ‘rise’ in the illicit trade. The figures obtained in our study are in a long line of studies from other countries, which have exposed that inflating the illicit tobacco trade figures is one of the TI tactics in interfering in public policies. Besides, there is also strong evidence that increasing tobacco taxes as well as other tobacco control efforts such as the introduction of plain packaging[[27]](https://paperpile.com/c/GP8QqD/OfYxC) do not increase the market share of the illicit tobacco products. For example, in a study in Mongolia, the illicit cigarette trade went down after two consequent tax increases.[[28]](https://paperpile.com/c/GP8QqD/xRZQy)

The Ministry of Health was keen to propose higher taxes in the budget (2020) and needed support by unbiased evidence of the scope and magnitude of the illicit tobacco trade in Pakistan. Studying Tobacco users of Pakistan (STOP) survey was planned and implemented keeping in mind the timely impact its evidence can have over the policymaking before the budget. The Ministry of Health has endorsed the results of the survey and proposed higher taxation on tobacco in the budget (July 2020) by using this evidence. Furthermore, the results were shared with the Federal Bureau of Revenue (FBR) and presented to the chairman of the advisory committee of finance to the government, who was in the process of formulating recommendations with regards tobacco taxation for the upcoming budget. In the 2020 July Budget, the tobacco taxes remained the same as of last year. This was considered a ‘win-win’ situation considering the strong lobbying and presence of TI influence on Pakistan policy-making scenario.

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| **What is already known:** the illicit tobacco trade increases tobacco consumption and tobacco-related deaths.  Tobacco industry estimates of the illicit cigarette trade are often higher than those generated independently.  **What important gaps in knowledge exist on this topic:** Independent and valid estimates of the illicit cigarette trade are not available for many high-tobacco burden countries, particularly low- and middle-income countries.  **What this study adds:** The estimated market share of the illicit cigarette trade in 10 major cities in Pakistan is considerably lower than the figures promoted by the tobacco industry in Pakistan - a high tobacco-burden country.  Estimating the illicit tobacco trade based on cigarette packs collection from waste recycle stores is a valid method and is likely to be cheaper than conducting consumer surveys. |

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**Competing interests:** none declared

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# References:

1 [World Health Organization. WHO global report on mortality attributable to tobacco. 2012.](http://paperpile.com/b/GP8QqD/gUvGL)

2 [Eriksen MP, Mackay J, Schluger NW, *et al.* The tobacco atlas. 2012.](http://paperpile.com/b/GP8QqD/wIUWG)

3 [Saqib MAN, Rafique I, Qureshi H, *et al.* Burden of Tobacco in Pakistan: Findings From Global Adult Tobacco Survey 2014. *Nicotine Tob Res* 2018;**20**:1138–43.](http://paperpile.com/b/GP8QqD/niu5z)

4 [GBD 2013 Risk Factors Collaborators, Forouzanfar MH, Alexander L, *et al.* Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2015;**386**:2287–323.](http://paperpile.com/b/GP8QqD/DyM7O)

5 [Policy brief. Social Policy and Development Centre 2019.](http://paperpile.com/b/GP8QqD/uR1cG)

6 [Social Policy and Development Centre. Macroeconomic impact of tobacco use in Pakistan. 2018.](http://paperpile.com/b/GP8QqD/bOTE2)

7 [Pakistan : Overview of Tobacco Use, Tobacco Control Legislation, and taxation.](http://paperpile.com/b/GP8QqD/1jQk) <http://documents1.worldbank.org/curated/en/498131560807146415/pdf> [(accessed 3 Mar 2021).](http://paperpile.com/b/GP8QqD/1jQk)

8 [Government of Pakistan. The Federal Excise Act, 2005-As amended up to 31 st December, 2019 by Tax Laws Second Amendment Ordinance, 2019. Government of Pakistan](http://paperpile.com/b/GP8QqD/gz0GD)

9 [Joossens L, Raw M. From cigarette smuggling to illicit tobacco trade. *Tob Control* 2012;**21**:230–4.](http://paperpile.com/b/GP8QqD/4vFCP)

10 [John RM, Ross H. Illicit cigarette sales in Indian cities: findings from a retail survey. *Tob Control* 2018;**27**:684–8.](http://paperpile.com/b/GP8QqD/FBgV1)

11 [Joossens L, Merriman D, Ross H, *et al.* The impact of eliminating the global illicit cigarette trade on health and revenue. *Addiction* 2010;**105**:1640–9.](http://paperpile.com/b/GP8QqD/n3Bkx)

12 [Asia Illicit Tobacco Report.](http://paperpile.com/b/GP8QqD/KyHOX) <https://www.oxfordeconomics.com/asia-illicit-tobacco> [(accessed 10 Oct 2020).](http://paperpile.com/b/GP8QqD/KyHOX)

13 [Ross H. A critique of the ITIC/OE Asia-14 illicit tobacco indicator 2013. *Bangkok: Southeast Asia Tobacco Control Alliance* 2015.](http://paperpile.com/b/GP8QqD/52fqu)

14 [Gilmore AB, Rowell A, Gallus S, *et al.* Towards a greater understanding of the illicit tobacco trade in Europe: a review of the PMI funded ‘Project Star’ report. Tobacco Control. 2014;**23**:e51–61. doi:](http://paperpile.com/b/GP8QqD/N4w8o)[10.1136/tobaccocontrol-2013-051240](http://dx.doi.org/10.1136/tobaccocontrol-2013-051240)

15 [Stoklosa M, Ross H. Contrasting academic and tobacco industry estimates of illicit cigarette trade: evidence from Warsaw, Poland. *Tob Control* 2014;**23**:e30–4.](http://paperpile.com/b/GP8QqD/wt1Yi)

16 [Maldonado N, Llorente BA, Iglesias RM, *et al.* Measuring illicit cigarette trade in Colombia. *Tob Control* Published Online First: 14 March 2018. doi:](http://paperpile.com/b/GP8QqD/vO1ly)[10.1136/tobaccocontrol-2017-053980](http://dx.doi.org/10.1136/tobaccocontrol-2017-053980)

17 [Kaplan B, Navas-Acien A, Cohen JE. The prevalence of illicit cigarette consumption and related factors in Turkey. *Tob Control* 2018;**27**:442–7.](http://paperpile.com/b/GP8QqD/Jkl2)

18 [Siddiqi K, Siddiqui F, Boeckmann M, *et al.* Attitudes of smokers towards tobacco control policies: Findings from the Studying Tobacco users Of Pakistan (STOP) survey. *Tob Control* 2020.](http://paperpile.com/b/GP8QqD/wcmhF)

19 [McBurney P. On Transferring Statistical Techniques Across Cultures: The Kish Grid. *Curr Anthropol* 1988;**29**:323–5.](http://paperpile.com/b/GP8QqD/gAy6b)

20 [Fidler JA, Shahab L, West R. Strength of urges to smoke as a measure of severity of cigarette dependence: comparison with the Fagerström Test for Nicotine Dependence and its components. *Addiction* 2011;**106**:631–8.](http://paperpile.com/b/GP8QqD/gg3f)

21 [StataCorp LLC. Stata Statistical Software. Release 16.[software]. College Station, TX. 2019.](http://paperpile.com/b/GP8QqD/ks1z)

22 [Nayab D, Junaid MN, Memon A, *et al.* Economics of tobacco taxation and consumption in Pakistan. Pakistan institute of development economics Islamabad. Pakistan institute of development economics Islamabad 2018.](http://paperpile.com/b/GP8QqD/dYX9q)

23 [Blecher E, Liber A, Ross H, *et al.* Euromonitor data on the illicit trade in cigarettes. *Tob Control* 2015;**24**:100–1.](http://paperpile.com/b/GP8QqD/HXuiB)

24 [Chen J, McGhee SM, Townsend J, *et al.* Did the tobacco industry inflate estimates of illicit cigarette consumption in Asia? An empirical analysis. *Tob Control* 2015;**24**:e161–7.](http://paperpile.com/b/GP8QqD/PjG4Y)

25 [Gallagher AWA, Evans-Reeves KA, Hatchard JL, *et al.* Tobacco industry data on illicit tobacco trade: a systematic review of existing assessments. Tobacco Control. 2019;**28**:334–45. doi:](http://paperpile.com/b/GP8QqD/2kNXW)[10.1136/tobaccocontrol-2018-054295](http://dx.doi.org/10.1136/tobaccocontrol-2018-054295)

26 [Ross H. Understanding and measuring cigarette tax avoidance and evasion: A methodological guide. 2015.](http://paperpile.com/b/GP8QqD/fQcHK)

27 [Scollo M, Zacher M, Coomber K, *et al.* Use of illicit tobacco following introduction of standardised packaging of tobacco products in Australia: results from a national cross-sectional survey. *Tob Control* 2015;**24**:ii76–81.](http://paperpile.com/b/GP8QqD/OfYxC)

28 [Ross H, Vellios N, Batmunkh T, *et al.* Impact of tax increases on illicit cigarette trade in Mongolia. *Tob Control* Published Online First: 19 June 2019. doi:](http://paperpile.com/b/GP8QqD/xRZQy)[10.1136/tobaccocontrol-2018-054904](http://dx.doi.org/10.1136/tobaccocontrol-2018-054904)

**Table 1: The city-wise distribution of the sample for each category of the data collected**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Cities | The consumer survey | | | The waste recycle store survey | |
| Estimated sample size | Participants | Cigarette packs collected (%) | Cigarette packs collected | Cigarette packs randomly selected |
| Karachi  Lahore  Faisalabad  Rawalpindi  Islamabad  Gujranwala  Peshawar  Multan  Hyderabad  Quetta  **Total** | 2293  1720  500  320  160  320  300  280  260  160  **6313** | 2122  1654  496  307  160  305  295  276  249  150  **6014** | 1026 (48)  545 (33)  252 (51)  120 (39)  51 (32)  116 (38)  33 (11)  101 (37)  145 (58)  27 (18)  **2416 (40)** | 2545  6760  2378  1200  1042  1100  1200  448  386  350  **17409** | 2232  1720  505  318  161  324  287  274  232  160  **6213** |

**Figure 1: Five criteria to determine illicit cigarette packs.**

Weighted Consumer survey and non-weighted waste recycle shop estimates.

**Figure 2: Number of criteria violated in illicit packs**

Weighted Consumer survey and non-weighted waste recycle shop estimates.

**Table 2: Differences in smokers’ characteristics between different groups including those using the licit and illicit packs**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Pack collected** | | | | **Pack not collected** | | | |
| Overall (%)  n=2416 | Licit (%)  n-1962 | Illicit (%)  n=454 | p | Overall (%)  n=3598 | Bought loose (%)  n=1844 | Bought not loose (%)  n=1754 | p |
| **Age**  15 – 30  31 – 50  51 – 65  >65 | 384 (15.9)  1162 (48.1)  666 (27.6)  204 (8.4) | 328 (16.7)  982 (50.1)  496 (25.3)  156 (8.0) | 56 (12.3)  180 (39.6)  170 (37.4)  48 (10.6) | .000 | 824 (22.9)  1696 (47.1)  796 (22.1)  282 (7.8) | 499 (27.1)  808 (43.8)  377 (20.4)  160 (8.7) | 325 (18.5)  888 (50.6)  419 (23.9)  122 (7.0) | .003 |
| Male  Female | 2379 (98.5)  37 (1.5) | 1933 (98.5)  29 (1.5) | 446 (98.2)  8 (1.8) | .657 | 3547 (98.6)  51 (1.4) | 1815 (98.4)  29 (1.6) | 1732 (98.7)  22 (1.3) | .419 |
| **Marital Status**  Single  Engaged  Married  Separated  Divorced  Widowed | 191 (7.9)  23 (1.0)  2136 (88.5)  6 (0.2)  4 (0.2)  54 (2.2) | 160 (8.2)  15 (0.8)  1741 (88.8)  3 (0.2)  3 (0.2)  38 (1.9) | 31 (6.8)  8 (1.8)  395 (87.0)  3 (0.7)  1 (0.2)  16 (3.5) | 0.62 | 479 (13.3)  89 (2.5)  2895 (80.6)  10 (0.3)  10 (0.3)  111 (3.1) | 304 (16.5)  48 (2.6)  1408 (76.5)  5 (0.3)  6 (0.3)  69 (3.8) | 175 (10.0)  41 (2.3)  1487 (84.8)  5 (0.3)  4 (0.2)  42 (2.4) | .002 |
| **Education**  None  < Primary  Primary  < Secondary  Secondary  High school  Graduate  Postgraduate | 841 (34.8)  289 (12.0)  284 (11.8)  309 (12.8)  274 (11.3)  195 (8.1)  171 (7.1)  52 (2.2) | 657 (33.5)  238 (12.1)  236 (12.0)  263 (13.4)  232 (11.8)  164 (8.4)  141 (7.2)  30 (1.5) | 184 (40.5)  51 (11.2)  48 (10.6)  46 (10.1)  42 (9.3)  31 (6.8)  30 (606)  22 (4.8) | .078 | 1193 (33.2)  432 (12.0)  373 (10.4)  458 (12.7)  496 (13.8)  322 (9.0)  255 (7.1)  65 (1.8) | 669 (36.4)  222 (12.1)  182(9.9)  247 (13.4)  242 (13.2)  146 (7.9)  114 (6.2)  18 (1.0) | 524 (29.9)  210 (12.0)  191 (10.9)  211 (12.0)  254 (14.5)  176 (10.0)  141 (8.0)  47 (2.7) | .000 |
| **HSI\***  Low  Moderate  High | 1259 (53.8)  895 (38.2)  188 (8.0) | 1008 (53.1)  733 (38.6)  159 (8.4) | 251 (56.8)  162 (36.7)  29 (636) | .101 | 2582 (79.3)  587 (18.0)  85 (2.6) | 1473 (92.3)  119 (7.5)  4 (0.3) | 1109 (66.9)  468 (28.2)  81 (4.9) | .000 |

\*HSI Heaviness of Smoking Index

**Table 3. City-wise distribution of the illicit cigarette packs.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Consumer Survey** | | | **Waste Recycle Store** | | | p-value |
| **Total** | **Illicit (weighted%)** | **95% CI** | **Total** | **Illicit (%)** | **95% CI** |
| Karachi  Lahore  Faisalabad  Rawalpindi  Gujranwala  Peshawar  Multan  Hyderabad  Islamabad  Quetta  Total | 1026  545  252  120  116  33  101  145  51  27  2416 | 102 (9.1)  149 (28.1)  64 (27.5)  23 (20.2)  34 (29.8)  6 (23)  23 (17.8)  19 (11.9)  17 (35.4)  17 (73.9)  454 (17.8) | 6.6 – 11.7  21.7 – 34.6  18.7 – 36.3  13.7 – 26.8  19.8 – 39.8  7.4 – 38.5  4.2 – 31.5  5.4 – 18.4  26.2 – 44.6  33.8 – 113.9  15.4 – 20.2 | 2232  1720  505  318  324  287  274  232  161  160  6213 | 256 (11.5)  314 (18.3)  71 (14.1)  102 (32.1)  54 (16.7)  23 (8.0)  12 (4.4)  44 (19.0)  47 (29.2)  123 (23.1)  1046 (16.8) | 10.2 – 12.8  16.4 – 20.0  11.0 – 17.1  26.9 – 37.2  12.6 – 20.7  4.8 – 11.2  1.9 – 6.8  13.9 – 24.0  22.0 – 36.2  16.5 – 29.7  15.9 – 17.7 | .473\* |

\*compared the estimates using adjusted Wald F-Test to account for the survey design.