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Extent of illicit cigarette sales in Nepal: findings from a retail survey

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ABSTRACT

Introduction Increasing the tax on cigarettes is widely considered the most effective method to reduce its consumption. However, Nepal has a low cigarette tax as policymakers in Nepal are concerned about illicit trade of cigarettes if taxes are increased.

Methods The study employed a retail survey approach used in India suitable for countries with prevalent loose cigarette sales, with improved methodology. In 2021, empty cigarette packs generated in a day's loose cigarette sales were collected directly from cigarette retailers from 23 primary sampling units covering rural/urban, geographic divisions, border/non-border to India and tobacco factory locations. The central points of each primary sampling unit were identified, and retailers were selected for the survey. A cigarette pack was classified as illicit if it had at least one of the following attributes: (a) no authentic excise duty sticker, (b) no graphic health warning, (c) no mention of 'maximum retail price/MRP' and (d) no production date, name, address and trademark.

Findings We collected 4307 empty cigarette packs from 1204 retailers and 0.33% of them were classified as illicit. The estimates varied across location with the highest prevalence of illicit packs in Kathmandu (1.25%). All the illicit cigarettes were imported and were high-priced brands (>90%), mostly found in urban areas and not bordering India.

Conclusion Our estimate of the illicit cigarette market share of 0.33% suggests that the industry's statement of 25% is grossly overstated.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ There are no independent and scientifically verifiable estimates of the nature and scale of the illicit cigarette trade in Nepal.

WHAT THIS STUDY ADDS

⇒ Using a market-suitable method for the loose cigarette market, this study provides an estimate of the extent of illicit cigarette trade in Nepal.

⇒ The findings contradict the claims of the tobacco industry of high illicit trade.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study debunks the preconception that illicit cigarette sales are high due to porous border with India, that cheap-priced low-quality cigarettes are illegally imported due to high-taxed domestic cigarettes and the price is the sole determining factor of illicit trade.

INTRODUCTION

Tobacco use contributes to high morbidity and mortality in Nepal.[1] It is responsible for 2 of every 10 deaths (19.4%) and smoking is the leading cause of death in Nepal.[2] The low prices of cigarettes relative to income have increased their affordability, contributing to a consistently high prevalence rate.[3] According to WHO STEPwise Approach to NCD Risk Factor Surveillance survey 2019, 17.1% of adults (2.8 million) currently smoke.[4]

Increasing the tax on cigarettes is the most effective method to reduce its consumption which is good for public health and raises revenue for the government.[5–7] However, Nepal has low total tax rate which is around 27% of the retail price of most sold brands (MSB) in 2020,[8] which is relatively low compared with WHO's recommended 75%.[9]

Policymakers in Nepal are particularly concerned about the illicit trade of cigarettes due to the porous border between India and Nepal. Surya Nepal Private Limited (SNPL), a leading cigarette company, argues that an increase in taxes could lead to an increase in illicit trade, especially from India, and has continually lobbied to the government not to increase cigarette taxes. Because the price difference between Nepal and India's MSB is minimal, with the MSB in Nepal 8.6% cheaper than in India in 2020,[10] authorities in Nepal have avoided implementing tax policies that could result in Indian cigarettes being cheaper than cigarettes in Nepal.

The threat of illicit cigarette trade is a valid concern as illicit trade can undermine the effectiveness of tobacco control policies and reduce revenue.[11] Global evidence suggests that developing countries are more susceptible to illicit trade than developed countries. The global illicit cigarette market was estimated at 11.6% in 2007[12] and 11.2% between 2010 and 2018[13]—9.8% in high-income countries and 16.8% in low-income countries.[12]

However, in the absence of national-level data on the scale of illicit cigarettes, cigarette companies around the world prey on the concerns of policymakers and present inflated and often unsubstantiated figures on illicit trade to discourage tax increases.[11] Like other tobacco companies around the world, the major cigarette company of Nepal, SNPL—a subsidiary company of Imperial Tobacco Company, India, claims that consecutive and steep increase in cigarette taxes in recent years has had a deleterious impact on the legal cigarette industry with emerging counterfeit production of popular

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brands.[14] SNPL has been claiming an increase in illicit cigarette trade from 6% in 2012,[15] 11% in 2014[16] and 25% in 2016.[17]

Global evidence demonstrates a systematic and consistent gap between academic and industry estimates of the illicit cigarette trade in many developing countries like India (2.73% and 6% vs 20%),[18 19] Vietnam (20% less than industry estimate),[20] Colombia (3.5% vs 14%)[21] and Lithuania (10.7% vs 17%).[22]

This paper aims to estimate the extent of illicit cigarette trade in Nepal using primary data collection from retailers combined with littered pack collection. This is the first nationwide study providing estimates of the illicit cigarette market in Nepal.

METHODS

There are several widely used and recommended methods to measure the extent of illicit cigarette trade, such as gap analysis, pack examination studies, survey of tobacco users and econometric modelling. Each method has its advantages and disadvantages.[23–25] However, many methods are not feasible in the case of Nepal due to the unavailability of required data. The possible and commonly used method is pack examination if there is a distinct pack feature, which allows determination of tax avoidance/evasion by visual inspection.[25]

In the Nepalese context, cigarettes are widely sold as single sticks and almost half of men who smoke consume <5 sticks/day.[26] Littered pack analysis could result in bias if the people purchasing whole packs are different (most likely wealthier) from those purchasing single sticks. Therefore, we used the pack examination method, an adapted methodology used in neighbouring countries of India[18] and Bangladesh[27] that collects empty packets from single stick retailers at the end of the day.[23] Additionally, discarded/littered cigarette packs were also collected from the streets nearby the retail shops (5 min walk), and photographs were taken of any brands stocked by each retailer that were not represented in the collection of empty packets at the end of the day to compare the estimates from different sources to the findings from retailers. A structured questionnaire was used to gather additional information from retailers.

Nepal is a country bordering India in the east, west and south sides which is a key area of concern for policymakers. The border areas to China are remote and difficult to access and are not as active/open as India for business. The pack collection was carried out in December 2021 ensuring as much geographic representation as possible and considering the concern about the Indian border.

We used rural/urban municipalities or sub/metropolitan city as primary sampling units (PSUs), selecting 23 PSUs. The selection of PSUs was carried out through a multistage purposive sampling technique. Within each province with more than 15% of the population proportion, two districts were selected and in each province with less than 15% of the population proportion, one district was selected. Within each district, one urban PSU and one rural PSU were selected. We chose not to randomly select districts and PSUs because we wanted to test the characteristics of different areas to see if they had an impact on the total number of illegal packs. Districts and PSUs were selected purposively to generate a sample with a mix of the following characteristics: (a) bordering and non-bordering to India; (b) urban and rural areas; (c) PSUs close to domestic cigarette factories; and (d) mix of different geographies (mountain, hill, terai). Figure 1 is a map showing the selected districts and PSUs.

We sampled 1004 retailers from seven provinces of Nepal. We took a further sample of 200 retailers from Kathmandu. We included Kathmandu Metropolitan City separately to ensure an adequate sample, given it is the largest urban area in Nepal, the central hub of business and has the largest international airport. The number of cigarette retail shops in each PSU was determined based on the population proportion of each province. With the sampled retailers, we assumed getting at least 5000 cigarette packets (considering an average of five packs/retailer) from the whole of Nepal giving enough sample for statistically significant results. Table 1 illustrates the summary of sampling design and detail is provided in online supplemental table 1.

The data collection team identified a central point in each PSU such as busy business, social areas, areas with government

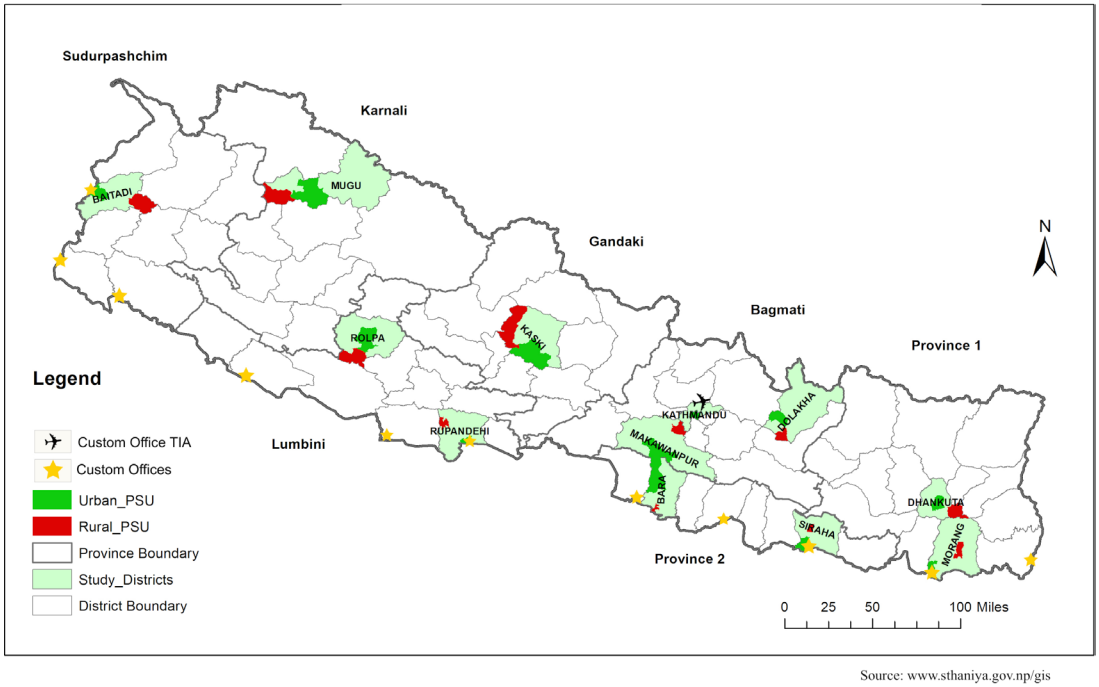

Figure 1 Illicit cigarette trade research study areas. PSU, primary sampling unit; TIA, Tribhuvan International Airport.

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Table 1 Sampling design

Province	Sample retailers	Districts selected (n)		Selected PSUs (n)		Ecozone	Remarks
		With border	Without border	Urban	Rural		
Province 1	171	1	1	2	2	1 hill, 1 terai	
Madhesh	204	2	0	2	2	Terai	P2 lies in Terai region.
Bagmati	209	0	2	2	2	1 mountain, 1 hill	
Gandaki	95	0	1	1	1	Hill	4 retailers have been boosted to make it at least 10 retailers in one PSU.
Lumbini	170	1	1	2	2	1 hill, 1 terai	
Karnali	59	0	1	1	1	Mountain	
Sudurpaschim	96	1	0	1	1	Hill	
Total	1004	5	6	11	11		
Kathmandu	200	0	1	1	0	Hill	
Total	1204	5	7	12	11		

P2, Province 2; PSU, primary sampling unit.

offices, colleges/schools and cigarette factory areas. All types of retailers selling loose stick cigarettes were eligible for inclusion except the street hawkers and dealers with small cigarette outlets who keep on moving. Retailers were briefed about the study purpose and written consent was taken. An empty bag with a unique ID was given to every retailer on the selected route and was asked to deposit all cigarette packs emptied throughout the day. The retailers were provided a small monetary reward of NPR10 (US$0.08) per empty pack deposited in the bag. The bags were collected at the end of the day towards the close of business. If the empty pack of that brand was not available in the bag, the team took a picture and coded all relevant attributes of such packs observed in the shop itself. Basic information such as the name and type of retail shop, and name, price and estimated quantity of the cheapest brand and the most popular brand sold in the shop was recorded by data collectors during bag collection using a questionnaire.

Each collected empty pack in the bag was photographed, coded for certain characteristics as outlined below and classified illegal if it had at least one of the following attributes: (1) absence of 'Correct and authentic excise sticker (ES)' mentioning cigarette length pasted on the pack, (2) absence of 'Cigarette production date, producer name, address, and trademark of the licensed manufacturer or importer and amount of nicotine', (3) absence of 'Maximum Retail Price (MRP)' inclusive of all taxes and (4) no graphic health warning (GHW): warning picture not showing 'lung cancer' for pack with 75% coverage of GHW and picture of 'lung cancer' or 'brain haemorrhage' or 'low birth weight' or 'disabled/still birth baby' or 'oral throat cancer' or 'oral cancer' for pack containing 90% coverage of GHW, and whether the warning message was in Devanagari (Nepali language), Preeti font. For both domestically produced cigarettes and imported ones, above requirements must be met for legal sale in Nepal under the Excise Directive 2068 Bikram Sambat (2011) modified version 2076 BS (2019),[28] Excise Duty Rules 2058 BS (2002)[29] and Directives for Printing and Labeling of Warning Message and Graphics in the Boxes, Packets, Wrappers, Carton, Parcels and Packaging of Tobacco Products—2068 BS (2011),[30] and 2014.[31] The GHW and authentic ES are provided in online supplemental figure 1.

To make our analysis more robust, we had a series of consultations with the Inland Revenue Department, Ministry of Finance, collected sample ES distributed to cigarette industries and got orientation on the process to distinguish between fake and authentic ES. Based on that process, we checked the ES with detailed scrutiny. The collected data were analysed in STATA V.13 and Microsoft Excel.

RESULTS

From the 1204 sampled single stick retailers, 4307 empty cigarette packets were collected (table 2). The retailers were of five different types: general stores (55%) (including groceries, shops, mini marts, etc), hotels and restaurants (28%), paan shops (7%), tea shops (8%) and others (2%) which included dairy, bakeries, electronic stores that sell cigarettes, etc. All the sampled retailers agreed to participate and provided their written consent to be part of the research. However, due to few sticks sold on the pack collection day, 48 retailers did not have any packs collected in the provided bag at the end of the business hours. Therefore, these 48 shops were excluded from the empty pack analysis.

Among the provinces, the highest number of packs was collected from Province 1 (881), followed by Bagmati and Lumbini Provinces, while the lowest collection was from Karnali (166) as expected due to the remoteness of the area. In the PSU-level collection, Kathmandu had the highest pack collection (960), followed by Hetauda (633) and Biratnagar (629). The result is very plausible due to the number of retailers sampled and the demographic characteristic of cities. Devtal and Annapurna PSUs had the lowest pack collection. This was likely as Devtal is a Terai region where most people use chewing tobacco, and Annapurna is a remote hilly region.

All packs collected were 20-stick packs (both domestic and imported); the Government of Nepal requires that cigarettes only be sold in packs of 20. A total of 31 different brands were collected from the retailers; only seven were imported brands (0.5% of collected packets) from either Indonesia or India. Almost all (99.5%) packs included 'Nepal Ma Baneko' in the local Nepali language or (Made in Nepal—in English) while 0.39% and 0.07% had written 'Made in Indonesia' and 'Made in India', respectively, on their outer packet.

The details of findings on the legal characteristics of cigarette packs are summarised in table 3. Of 4307 packs, only 14 (0.33%) did not have any sign of authentic ES indicating it as illegal. All the packs with ES had mentioned the length of the cigarettes while the imported packs did not have length but 'Imported' was mentioned on the ES.

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Table 2 Empty cigarette pack collection

Province	Retailers	PSU	Retailers	Packs collected	Total packs collected n (%)	Mean packs (SE; 95% CI)
Province 1	171	Dhankuta	20	85	881 (20.45)	5.15 (0.19; 4.77–5.53)
		Chaubise	11	87		
		Biratnagar	119	629		
		Kanepokhari	21	80		
Madhesh	204	Jeetpur-Simara	99	259	485 (11.26)	2.38 (0.12; 2.13–2.63)
		Devtal	20	14		
		Siraha	69	148		
		Naraha	16	64		
Bagmati	409	Hetauda	143	633	863 (20.01)	4.14 (0.11; 3.93–4.37)
		Indrasarowar	16	51		
		Bhimeshwor	30	131		
		Melung	19	48		
		Kathmandu	200	960	960 (22.29)	4.8 (0.21; 4.37–5.23)
Gandaki	95	Annapurna	10	10	243 (5.64)	2.54 (0.26; 2.08–2.98)
		Pokhara	90	233		
Lumbini	170	Rolpa	35	60	487 (11.31)	2.86 (0.16; 2.56–3.17)
		Runtigadhi	30	56		
		Siddharthanagar	69	277		
		Kanchan	36	94		
Karnali	59	Chhayanath Rara	27	93	166 (3.85)	2.81 (0.27; 2.27–3.36)
		Khatyad Rural	27	73		
Sudurpaschim	96	Dasharath Chand	59	152	222 (5.16)	2.31 (0.19; 1.93–2.70)
		Sigas	37	70		
Total				4307	4307 (100)	3.58 (0.72; 3.44–3.72)

PSU, primary sampling unit.

Twelve packs (0.3%) did not have a production date written, all packs had the producer's name, all except three packs (0.1%) had the producer's address and all had a trademark. All except 12 packs (0.3%) had an MRP included on the pack. The MRP written on the pack ranged from 43.5 rupees (US$0.348) to 295 rupees (US$2.36). The variation in price is valid since Nepal has five different cigarette length tiers with different price range. The average price was 163 rupees (US$1.3).

Table 3 Summary of legal characteristics

Legal characteristics		Packets (n)	%
Authentic excise sticker	Yes	4293	99.67
	No	14	0.33
Production date	Yes	4296	99.74
	No	11	0.26
Producer name	Yes	4307	100.00
Address	Yes	4304	99.93
	No	3	0.07
Trademark	Yes	4307	100.00
Maximum retail price (MRP)	Yes	4295	99.72
	No	12	0.28
Health warning text (HWT)	Yes	4294	99.70
	No	13	0.30
Health warning picture (HWP)	Yes	4294	99.70
	No	13	0.30
Graphic health warning coverage	0	13	0.30
	75%	4273	99.21
	90%	21	0.49
Length of cigarette	Yes	4286	99.51
	No	21	0.49

To be legal, the cigarette pack should have 90% GHW coverage but most of the domestic cigarettes had only 75% coverage. After the 90% GHW directive was passed in 2014, a writ was filed by tobacco companies in Supreme Court of Nepal; only in August 2022 the Supreme Court ruled in favour of 90% GHW coverage.[32] Hence, packets with 75% GHW are considered legal in our analysis. Thirteen packs (0.30%) did not include a 75% GHW; these were the same packs that did not have ES and were imported brands. In the remaining 99.7% of packs, 0.49% (21 packs) did have 90% GHW coverage showing full implementation of law.

Overall, weighted by the number of packs collected, 0.33% (95% CI 0.18% to 0.55%) of sampled packets were identified as illegal of 4307 packets collected. None of the packs had an authentic ES or GHW. The share of illicit packs varied by location (table 4). The highest number of illicit packs was found in Kathmandu, constituting 1.25% [S.E; 0.0036; CI: 0.69% to 2.19%] of the sample packs. Like Kathmandu, Pokhara, the second most developed city of Nepal and not close to the Indian border, had 0.43% [S.E; 0.0043; CI: 0.10% to 2.4%] of packs designated as illicit. Only 0.68% [S.E; 0.0067; CI: 0.17% to 3.7%] of illicit packs were collected from Siraha PSU, which lies in Madhesh province and borders India. No illicit packets were collected from other busy and developed PSUs like Biratnagar, Jeetpur-Simara and Siddharthanagar that borders India, even though the samples were large enough.

Analysis of the nature and characteristics of the illicit packs collected showed that no domestically produced packs were found to be illegal, while all the illegal packs were imported.

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Table 4 Share of illicit packs by PSUs

Province	PSU	Bordered/non-bordered	Urban/rural	Packs collected	Proportion of packs collected (%) (SE; 95% CI) (A)	Proportion of illegal packs (%) (SE; 95% CI) (B)	Prevalence adjusted by total packs collected (%) (SE; 95% CI) (A)*(B)
Province 1	Dhankuta	Non-bordered	Urban	85	1.97 (0.0021; 1.58–2.43)	0	0
	Chaubise	Non-bordered	Rural	87	2.02 (0.0021; 1.62–2.49)	0	0
	Biratnagar	Bordered	Urban	629	14.60 (0.0053; 13.56–15.69)	0	0
	Kanepokhari	Bordered	Rural	80	1.86 (0.0021; 1.48–2.31)	0	0
Madhesh	Jeetpur-Simara	Bordered	Urban	259	6.01 (0.0036; 5.32–6.76)	0	0
	Devtal	Bordered	Rural	14	0.33 (0.0008; 0.18–0.55)	0	0
	Siraha	Bordered	Urban	148	3.44 (0.0028; 2.91–4.02)	0.68 (0.0067; 0.17 to 3.7)	0.023 (0.00023; 0.00–1.3)
	Naraha	Bordered	Rural	64	1.49 (0.0018; 1.11–1.89)	0	0
Bagmati	Hetauda	Non-bordered	Urban	633	14.70 (0.0054; 13.65–15.79)	0	0
	Indrasarowar	Non-bordered	Rural	51	1.18 (0.0016; 0.88–1.55)	0	0
	Bhimeshwor	Non-bordered	Urban	131	3.04 (0.0026; 2.55–3.60)	0	0
	Melung	Non-bordered	Rural	48	1.11 (0.0016; 0.82–1.48)	0	0
	Kathmandu	Non-bordered	Urban	960	22.29 (0.0063; 21.05–23.56)	1.25 (0.003; 0.69 to 2.19)	0.28 (0.00080; 0.14–0.49)
Gandaki	Annapurna	Non-bordered	Rural	10	0.23 (0.00073; 0.11–0.43)	0	0
	Pokhara	Non-bordered	Urban	233	5.41 (0.0034; 4.75–6.13)	0.43 (0.0043; 0.10 to 2.4)	0.023 (0.00023; 0.00–1.3)
Lumbini	Rolpa	Non-bordered	Urban	60	1.39 (0.0018; 1.07–1.79)	0	0
	Runtigadhi	Non-bordered	Rural	56	1.30 (0.0017; 0.98–1.69)	0	0
	Siddharthanagar	Bordered	Urban	277	6.43 (0.0037; 5.72–7.21)	0	0
	Kanchan	Bordered	Rural	94	2.18 (0.0022; 1.77–2.66)	0	0
Karnali	Chhayanath Rara	Non-bordered	Urban	93	2.16 (0.0022; 1.75–2.63)	0	0
	Khatyad	Non-bordered	Rural	73	1.69 (0.0020; 1.33–2.13)	0	0
Sudurpaschim	Dasharath Chand	Bordered	Urban	152	3.53 (0.0028; 2.10–4.12)	0	0
	Sigas	Bordered	Rural	70	1.63 (0.0019; 1.27–2.05)	0	0
Total				4307	100		0.33 (0.00087; 0.19 to 0.55) (rounded sum of the above)

PSU, primary sampling unit.

More than three-quarters (78.57%) of the illicit packs were imported from Indonesia and the rest from India. Of the illegal packs, one pack was found to be a counterfeit product since it was like the domestic brand; the ES was identified as a duplicate after the consultation/observation by Inland Revenue Department. This pack was found near the India border.

Illegal packs were mostly found in urban city areas such as Kathmandu and Pokhara. These are also areas with a high movement of people via both domestic and international flights, which could be an explanatory factor. Most illegal packs were not found near areas bordered by India. The market price range of the found illicit cigarette packs is high ranging from NPR200 to NPR288 (US$1.6–US$2.3) except for the counterfeit pack (NPR80/US$0.64), which represents the high-priced cigarette range.

To check the representativeness of the findings of the retailers' pack collection, we also collected empty cigarette packs from the streets surrounding the sampled retailers. A total of 166 cigarette packs were collected from the litter on the street. A small number of packs were collected because of the municipality cleaning campaign in some of the areas. Only one pack (0.60%, SE 0.0060; 95% CI 0.15% to 3.3%) imported from India with the brand 'Khukuri' was found to be illegal among the collected packs and was found in India border Siraha Municipality, Madhesh Province. The same counterfeit pack was also collected from retailers of Siraha.

DISCUSSION

Our study is the first nationwide research of its kind, providing estimates of the nature and scale of the illicit tobacco market in Nepal. This study found 0.33% (14 packs) of illicit packs in the entire sample of 4307 packs collected across Nepal in 2021. This is lower than India and Bangladesh's retail survey findings of 2.73%[18] and 5.4%[33] of illicit cigarette packs, respectively, using the same methodology. This indicates that the use of illicit cigarettes among single stick cigarette users is nominal in Nepal, compared with India and Bangladesh. Nepali single stick cigarette users could be less likely to use illicit cigarettes. This may be because Nepal's legal cigarettes are affordable for consumers and there is less incentive for people to seek out other illicit alternatives; second, Nepal is a landlocked country with limited access to the sea, which makes it more difficult to bring in illicit cigarettes. This study's finding indicates that the illicit market in Nepal is relatively modest compared with the global estimated average of 11.6% and 16.8% in low and middle-income countries[34] and well below the claim of the tobacco industry which is 25% of the total tobacco market.[17]

This study found that all the illegal packs were imported and were predominantly Indonesian brands. Only one illegal pack was found in a district bordering India, suggesting that illegal cigarettes being smuggled over the Indian border is not a key route for illegal cigarettes. Most of the illicit cigarettes being Indonesian brands with high retail prices contradicts the perception that illegal cigarettes are driven by cheaper Indian cigarettes. This suggests that price is not the sole determining factor; consumer preference can be a contributing factor in illicit trade of cigarettes.

A high concentration of the illicit packs in non-border areas with high price range contradicts tobacco industry and policymaker claims that (1) illicit cigarettes are found more on India

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border due to the porous border between the two countries, (2) the lower priced cigarettes are illegally imported in Nepal and (3) the high price of domestic cigarettes due to tax increase is leading the illicit trade. Further, the industry always opposes cigarette tax increases using the SCARE[9] tactics—increase in illicit trade (S), court and legal challenges (C),[32 35] antipoor or regressive (A), revenue reduction (R) and impact on legal industries consequently on the employment (E)[14] since SNPL is a large tax payer and is awarded by Inland Revenue Department every year.[36 37] This study's finding shows that SNPL and other tobacco companies have been over-reporting illicit trade estimate likely to counter tax increases.

The use of pack examination methodology, a suitable method for countries selling single stick cigarettes, inclusion of 1204 retailers across the whole of Nepal's diverse geography and collection of 4307 cigarette packs, which is a large enough sample to make robust estimates, give us high confidence that the results of this study have high internal validity. Further, the robustness of the findings has been validated by three additional methods: the littered pack collection, the direct interaction with cigarette retailers and pack photo collection.

Nevertheless, there are some limitations of the study. First, the study primarily relies on empty pack collection from retailers, which only represents a part of the loose cigarettes sold in Nepal and may not represent those buying full packs. But through the littered pack collection, we have tried to compensate for this weakness and the consistent results obtained were reassuring. These methods can be used in other low and middle-income countries where there is a high proportion of single stick sales. Second, our findings relied on the empty packs provided by retailers sold that day and there was a possibility that retailers would want to hide the illicit packs, making the study result (proportion of illicit cigarette) biased downward. But consistent results were obtained from the collection of littered packs. Third, our study only collected packs from the sampled cigarette retailers. Street hawkers and dealers with small cigarette outlets who keep on moving were not included. Fourth, retailers could be selling duty-free cigarettes and this study is unable to distinguish legal tax avoidance from illicit cigarette.

The finding of a cheaper counterfeit brand 'Khukuri' both in retailers and street collection near the India border at Siraha Municipality mandates further exploratory research in and around that area to control future smuggling. Further, it is worth noting that the nature of smuggling may change over time depending on the smugglers' tactics to penetrate the cigarette market. Therefore, considering the limitations and findings, the government needs to address the problem of illicit trade by strengthening the administration and governance. More studies are warranted.

CONCLUSIONS

We found a total of 0.33% of illicit cigarette packs in the entire sample of packs collected from retailers across Nepal. This represents less than 1 in every 200 packs. These findings are reinforced by examinations of littered packs collected from the streets near retailers and photographs of other brands stocked by retailers. Our estimate of the illicit cigarette market share is in sharp contrast with that provided by the industry. Our findings suggest the industry estimates of 25% are grossly overstated.

Therefore, we urge policymakers not to let claims of illicit trade deter decisions to increase the taxation of tobacco. There is significant room for the government to raise taxes further and strengthen tobacco control. Raising tobacco tax will provide both economic benefits to the government, in terms of increased revenue, and health benefits to the public, through a decline in tobacco consumption. Further, the higher tax revenue after a tax increase could be used to support enforcement agencies to control the illicit cigarette trade in the future.

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Supplementary Material: Extent of illicit cigarette sale in Nepal: findings from retailer's survey

ADDITIONAL METHODS:

1. Sample size calculation:

To ensure representativeness and reliability of the survey results we used following method to derive sample size at national level.

$$n = \frac{Z_{1-\alpha}^2 \cdot P(1-P) \cdot DEFF}{e^2}$$

Here,
n= number of packets required
Z= 1.96, for 95% confidence level
P= 0.25 (25% of illicit market was assumed as per the industry claim)
e = 0.02 (2%) margin of error
DEFF = 2 (allowing for variability in the number of collected packs and the prevalence of illicit packs)

$$n = \frac{3.8416 \cdot 0.25(1-0.25) \cdot 2}{0.02^2}$$

$$n = 3602\ packets$$

Using above formula, the minimum required packs for the survey was 3602. However, to make sure of getting enough packets we targeted to collect 5000 packs and sampled 1000 retailers with the assumption of getting average of 5 packs from each retailer. On top of this additional 200 retailers were selected from Kathmandu metropolitan city. The detail of the retailer's selection is provided in the supplementary table 1.

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Supplementary table 1

Illicit Trade of Cigarette Research: Packet Analysis Sampling Design										
Province	**Total population of state**	**State population proportion (%) (A)**	**No. of cigarette retailers required (N=A*1000)**	**Eco-zone**	**District**	**Selected PSUs**	**Population of PSU (B)**	**Total population of sampled PSUs in each province (C)**	**Population proportion of PSUs (%) (p=B/C)**	**No of retailers by PSUs (n=p*N)**
Province 1	4534943	17.12	171	Terai	Morang	Biratnagar Metropolitan city	214,663.00	308,598.00	69.56	119
						Kane Pokhari Rural Municipality	38,033.00		12.32	21
				Hill	Dhankuta	Dhankuta Municipality	36,619.00		11.87	20
						Chaubise Ruram Municipality	19,283.00		6.25	11
Province 2	5404145	20.4	204	Terai	Bara	Jitpur Simara Sub-metropolitan city	117,496.00	242,619.00	48.43	99
						Devtal Rural Municipality	23,223.00		9.57	20
				Terai	Siraha	Siraha Municipality	82,531.00		34.02	69
						Naraha Rural Municipality	19,369.00		7.98	16
Bagmati	5529452	20.87	209	Hill	Makwanpur	Hetauda Sub metropolitan city	152,875.00	223,150.00	68.51	143
						Indra Sarobar Rural Municiapality	17,585.00		7.88	16
				Mountain	Dolakha	Bhimeshor Municiapality	32,480.00		14.56	30
						Melung Rural Municipality	20,210.00		9.06	19

Gandaki	2403757	9.07	91	Hill	Kaski	Pokhara Metropolitan City	414,141.00	437,558.00	94.65	86
						Annapurna Rural Municipality	23,417.00		5.35	10
Lumbini	4499272	17	170	Terai	Rupandehi	Siddharthanagar Municipality	63,483.00	157,253.00	40.37	69
						Kanchan Rural Municipality	33,072.00		21.03	36
				Hill	Rolpa	Rolpa Municipality	32,769.00		20.84	35
						Runti Gandi Rural Municipality	27,929.00		17.76	30
Karnali	1570418	5.93	59	Mountain	Mugu	Chhayanath Rara Municipality	20,078.00	37,194.00	53.98	32
						Khatyad Rural Municipality	17,116.00		46.02	27
Sudurpaschim	2552517	9.63	96	Hill	Baitadi	Dasarath Chand Municipality	34,575.00	56,085.00	61.65	59
						Sigas Rural Municipality	21,510.00		38.35	37
Total	**2649504**		**1000**			**Total**	**1,462,457.00**			**1004**
International Border			200	Hill	kathmandu	Kathmandu Metropolitan city	975,453.00			200
Population source:www.sthaniya.gov.np/gis, Ministry of Federal Affairs and General Administration (MoFAGA), GoN.										

Figure 1: The graphic health warnings and authentic excise sticker

Figure 1 Cigarette packs with 5 different Health Warnings (left) and Authentic excise sticker with Nepal Government Logo and security measure (right)

Source: Ministry of Health and Population and Inland Revenue Department, Government of Nepal