An Analysis of the Tobacco Market in Jordan: A Household Survey

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Acronyms

DEFF   Design Effect

DOS   Department of Statistics

GYTS   Global Youth Tobacco Survey

IBM   International Business Machines

ID   Identification

IRB   Institutional Review Board

JD   Jordanian Dinars

JUST   Jordan University of Science and Technology

MOH   Ministry of Health

QR Codes   Quick Response Codes

SD   Standard Deviation

SPDC   Social Policy and Development Centre

SPSS   Statistical Product and Service Solutions

STEPs   The Jordan National Stepwise Survey

UN   United Nations

VAT   Value Added Tax

WHO   World Health Organization

Executive Summary

The heavy consumption of tobacco products in Jordan poses significant public health and economic challenges, as highlighted by our household smoker pack examination survey. With one of the highest smoking prevalence rates globally, Jordan faces a public health crisis, which is exacerbated by affordable cigarettes as well as the availability of illicit cigarettes. This study is based on a survey conducted in 2024 in the Amman, Irbid and Al Mafraq governorates, which collectively account for 70 percent of the Jordanian adult population and assesses the tobacco market in Jordan comprehensively, focusing on socio-demographic factors, smoking behaviours, and the extent of illicit cigarette use.

KEY FINDINGS

High smoking intensity: Among 463 participants, 84 percent were male, and the majority were daily smokers. Male smokers consumed an average of 26.2 cigarettes per day, compared to 25.1 for females.

Cigarette prices: Cigarettes are cheap and affordable in Jordan, contributing to the high rates of smoking prevalence and consumption. Overall, the average price per pack was JD 2.14, with a range of JD 0.3 to 4.5. Notably, the average prices of illicit and licit packs are similar, but the range varies significantly. The average purchase price of illicit and licit packs was JD 2.13 (Range: 0.3–4.5) and JD 2.15 (Range: 1.15–4.5).

Illicit cigarette usage: 22.2 percent of all smokers purchased illicit cigarettes, with higher prevalence among males (24.4 percent) compared to females (10.8 percent). Smokers aged 26-35 and those residing in Amman or AlMafraq were the most likely to purchase illicit cigarettes.

Demographic factors: Married individuals and those with higher education levels were more likely to buy illicit cigarettes, suggesting socio-economic complexities influencing consumer behaviour.

Public health concerns: While the average prices of illicit and licit packs are similar, some illicit cigarettes are cheaper than legal ones and, therefore, more attractive to young people and those with lower incomes. Also, a significant proportion of illicit cigarette packs lacked required health warnings, reducing the effectiveness of public health campaigns.

Brand dynamics: Prominent brands like Winston and Marlboro dominate the market. However, the presence of lesser-known brands in the illicit segment reflects some infiltration of smuggled products.

This study underscores the need for targeted policy interventions, including raising excise taxes on tobacco products but in close combination with the development and enhanced enforcement of regulations that secure the tobacco supply chain. Such efforts will help to mitigate the illicit cigarette market. Also, better-targeted public education campaigns, and cessation programs will help to drive down smoking initiation and enhance quitting. Addressing these issues is vital for improving public health outcomes and safeguarding government revenue from tobacco taxation.

Introduction

The prevalence of tobacco smoking in Jordan is one of the highest worldwide. Recent evidence demonstrates that Jordan is facing a public health catastrophe in its tobacco use. The Jordan National Stepwise Survey (STEPs) for Noncommunicable Diseases Risk Factors 2019, interviewing Jordanian adults aged 18-69 years, revealed that 41 percent of respondents were current tobacco smokers (65.3 percent among men and 16.4 percent among women)[1]. Similarly, the 2014 Global Youth Tobacco Survey (GYTS) illustrated that the prevalence of using any tobacco product among youth aged 13-15 years was 24 percent in Jordan (33.9 percent among boys and 13.8 percent among girls)[2].

Cigarettes are generally inexpensive and affordable for the average consumer in Jordan. The price of the most popular brand of cigarettes (pack of 20) is 2.25 JD (3.17 USD) [3]. The tobacco tax share of the retail price of cigarettes has been consistently high in Jordan over the last 10 years. The share of total taxes in the retail price of the most widely sold brand of cigarettes is 78 percent, but the total excise tax is 64 percent. The World Health Organization (WHO) recommends raising tobacco excise taxes so that they account for at least 70 percent of retail prices [3, 4]. However, a high tax share is only meaningful when the absolute price of cigarettes is high, which is currently not the case in Jordan.

To make tobacco products even less affordable in Jordan, a more vigorous examination and reconsideration of the country's tobacco tax structure is needed. Tobacco products are taxed primarily with a specific excise tax in Jordan (there is also a 16 percent VAT); however, it is a tiered rate that varies according to price levels. This translates into high price variation, which means that there are still very inexpensive cigarettes on the market. Jordan urgently needs to adopt the international best practice of a uniform tax structure wherein all cigarette brands are treated similarly in terms of the specific excise tax. Such a structure would dramatically reduce price variation [3, 5].

In countries without an effective system in place to secure the cigarette supply chain, an increase in taxes/prices can sometimes lead to increases in illicit trade. As of early 2025, Jordan does not yet have official estimates of the illicit trade of cigarettes because it lacks a formal system to monitor these levels. Illicit trade evades taxes, leading to substantial revenue loss for governments [6]. More importantly, illicit trade increases the affordability and accessibility of tobacco products, resulting in higher tobacco use, which is linked to higher incidence of mortality and morbidity [7, 8]. Furthermore, international evidence has shown a systematic and consistent gap between academic and tobacco industry estimates of illicit cigarette trade [7, 9-12]. Such a gap emphasizes

the need for unbiased and objective evaluations of the size and magnitude of the problem to best guide government policies and actions.

There is no ban on duty-free sales of tobacco products in Jordan nor earmarking tobacco tax revenue for any particular spending purpose [3, 13]. The law prohibits the sale of single cigarettes and the sale of tobacco products by vending machines or within 250 meters of educational and health facilities [14, 15]. However, there are no restrictions on the sale of tobacco products via the internet or in small packets of cigarettes. The sale of tobacco products is prohibited to persons under the age of 18 years in Jordan; however, this regulation is not fully enforced [16].

The tobacco industry's exploitation of illicit trade to resist tobacco tax hikes underscores the need for a comprehensive understanding of the illicit trade landscape in Jordan. Such understanding is crucial to formulating new tobacco control regulations, allowing policymakers to prioritize actions against smuggling networks and counterfeit operations. Accurate measurements inform policy decisions, enabling governments to design effective regulations to curb illicit trade and protect legal businesses.

On 25th July 2024, UN Secretary-General António Guterres announced that Jordan joined the Protocol to Eliminate Illicit Trade in Tobacco Products (Jordan Times, 30th July 2024). This treaty addresses the threats posed by failures to secure the tobacco product supply chain and the measures that countries must take to prevent it. According to the Jordan News Agency, Petra, this step is an important milestone for the success of the National Action Plan 2024-2026, which is part of the broader National Tobacco Control Strategy 2024-2030. This accession strengthens the effectiveness of national public health, tax administration and customs policies to eradicate all forms of the illicit tobacco trade, defined as any prohibited practice or behaviour related to the production, possession, distribution, sale, or purchase of tobacco products. The Protocol aims to strengthen cooperation between countries, facilitate the exchange of information, and enforce effective measures. Jordan's accession to the Protocol took effect on October 23, 2024 [17, 18].

In addition to taxation, Jordan has implemented some tobacco control measures but they appear to fall short of addressing the crisis. Although the law in Jordan prohibits smoking in "public places" [16], it fails to list all indoor public places and workplaces; the result is that this smoking ban is implemented inconsistently [16]. For example, complete smoking bans are implemented in healthcare facilities, private and public schools, and public transport. However, universities, governmental facilities, private offices, restaurants, bars, and cafes do not have a smoking ban.

Article 56 of Public Health Law No. 47 requires health warnings approved by Jordanian Standards and Metrology or the Ministry of Health to be displayed on all tobacco products produced, imported, or sold in the country [16]. In particular, picture-plus-text warnings must occupy 40 percent of the front of the pack, placed along the bottom edge. The warnings must be surrounded by a black border and printed on a white background. The 40 percent calculation does not include the border. The law requires a "regular" distribution of the four picture-plus-text warnings [19].

This research is based on a detailed study of the tobacco market in Jordan, including company market shares, brand market shares, imported vs domestic cigarettes, compliant vs non-compliant cigarettes, and self-reported prices. The main focus of the analysis is identifying the extent of the trade of non-tax-paid cigarettes.

Methods

Study design

A national household smoker pack examination survey was conducted in three populous governorates in Jordan to enroll eligible participants. The target population included all Jordanian residents (men and women) aged 18 years and older who reported current cigarette smoking, defined as having smoked at least one cigarette in the past 30 days [20]. Participants were individuals who considered their private household as their primary residence the night before the survey and agreed to participate in the survey.

Two methods were employed for data collection:

- Self-Reporting: Smokers provided self-reports on cigarette characteristics and consumption patterns and reported details on the type and source of cigarette packs, prices, and distinctions between legally compliant and non-compliant brands, as well as the extent of the non-tax-paid cigarettes.

- Pack Examination: The research team also visually examined cigarette packs held by smokers to validate the self-reported information.

The research team utilized a framework and sketch map of household clusters in Jordan from the Department of Statistics (DOS) to systematically select clusters in the three prominent governorates, followed by selecting blocks within these clusters and households within the designated blocks.

Sampling

A multistage cluster sampling technique was implemented through the following steps:

1. Selection of governorates: A purposive sampling method was employed to select three densely populated governorates in Jordan—Amman, Irbid, and Al Mafraq—ensuring representation from all regions. These governorates collectively account for 70 percent of the Jordanian adult population [21].

2. Cluster selection: Geopolitical areas (16 clusters: 6 in Amman; 3 in Irbid; 7 in Mafrag) were randomly selected within the identified governorates.

3. Block selection: A random sample of blocks (18 blocks: 8 in Amman; 6 in Irbid; 4 in Mafrag) within the selected clusters was identified, ensuring adequate representation.

4. Household selection: From a comprehensive list of households in each selected block, 20 households were randomly chosen using a systematic sampling technique (selecting every *ith* household, where *i* equals the total number of households in the block divided by 20).

5. Participant selection: One eligible resident (male or female) who reported current smoking was chosen for each household. Each household was visited twice before being marked as 'Not at home.' The next household (next door) was selected if a household was uninhabited or lacked eligible smokers.

Sample Size

The sampling frame for this study included adult smokers aged 18 years and older residing in three populous governorates in Jordan. Assuming that 15 percent of adult smokers use illicit cigarettes, a design effect (DEFF) of 2, and an anticipated response rate of 90 percent, the study required a sample size of 436 to estimate the expected proportion with 5 percent absolute precision and 95 percent confidence. The estimate that 15 percent of adult smokers use illicit cigarettes was based on discussions with the Local Taxes Department. The sample size was calculated using an online calculator that adjusts the sample size for clustering and response rate [22].

Household survey

Face-to-face interviews were conducted with the eligible participants. The survey was adopted from a questionnaire developed by the Social Policy and Development Center (SPDC), Pakistan. (Jamal, et al., 2023). Individual interviews were conducted with eligible smokers in a private setting to minimize social desirability bias. Rather than directly asking about the legality of the cigarettes, the interviewers focused on observable characteristics such as the cigarette pack or stick, as well as the price. This

indirect approach allowed for gathering critical data without putting smokers in a position where they might feel compelled to misreport. The survey was kept brief to ensure participant cooperation, with questions limited to essential topics and a duration of 10 minutes. These questions were designed to identify legally compliant versus non-compliant cigarettes, distinguish between local and imported brands, and gather information on smoker behaviour and consumption patterns.

Structure of the questionnaire:

1) The first section comprised a filter to include only Jordanian residents, as well as informed consent and basic characteristics of the individual such as age, gender and location. The screening questions were designed to determine if the subject is eligible to participate in the study (inclusion criteria) and socioeconomic status, such as participant education level, employment status, and monthly income.

2) The second section characterized the individual's cigarette smoking behaviour and patterns and the pack of cigarettes, when available.

3) The third section captured data on characteristics of the last purchase of the regular brand usually smoked, including price and place of purchase. The enumerators asked the smokers to show their cigarette packs. Whenever smokers had several cigarette packs available (for example, there were multiple packs in the household), we included only the last purchased pack of the regular brand usually smoked. To capture smoking intensity, we asked about how many cigarettes were smoked per day or week. Once the last-purchased pack of the regularly smoked brand was shown, the enumerators collected data on the pack characteristics. The survey included all necessary questions about the pack features that aided in distinguishing between licit (compliant) and illicit (non-compliant) packs.

4) The fourth section focused on identifying the extent of the non-tax-paid cigarettes. This section included questions on the pack brand, the presence of appropriate tax stamps (or QR codes), the presence, type, size, and language of the health warning and other pack markings required by law. To obtain objective information, the interviewers took pictures of each side of the presented pack (6 images for each pack). These pictures helped to identify coding errors since researchers could refer to the pack images if issues arose. Images were taken with a cell phone, matching the participant ID, date, time, and place associated with each image. This facilitated matching to the appropriate questionnaire and ease of searching, and it proved helpful during the data analysis phase. The questions about cigarette brands included a list of cigarette brands available on the market. The option to enter the brand name

manually was available in case the brand name was not included on the list provided.

Identification of non-compliant and/or imported cigarettes

During the preparation phase, the Local Taxes Department was contacted to understand pack characteristics in Jordan and the criteria for pack compliance. Identification of non-compliant and/or imported cigarettes or brands was based on the information provided by smokers and then validated by the pictures/images taken of the packs during the interviews to determine the percentages of the non-tax-paid cigarettes.

There were two groups of smokers found during the household survey:

1) Group 1 was the one that had the pack with them. In these cases, enumerators recorded information on the brand, country of origin, health warning and the import/production statement directly from the pack, and a photograph of the package was taken for quality control of data to distinguish compliant and non-compliant packs. As mentioned earlier, the smokers were asked to show the pack of their last purchased/smoked regular brand.

2) Group 2 consisted of people who had no cigarette packs available. These cases were excluded from the analysis to minimize faulty and subjective data resulting from potential recall bias. There were only two smokers in this group, and they were excluded from the final analysis.

To classify cigarette packs as non-compliant, the following filters were applied to all observations:

1) The most critical filter was the presence of a legally required Jordanian government QR code on the pack. Packs with no Jordanian QR code were non-compliant and considered illicit.

2) Packs with no tax stamp or no traces/fragments of a tax stamp were considered non-compliant. However, we recognize a limitation in our survey: it is possible that some packs might have had stamps that fell off, leaving no trace behind.

3) A health warning covering 40 percent of the front surface of the pack is required in Jordan. Packs without a proper health warning were also considered non-compliant/illicit.

4) Foreign/imported packs were identified whenever the country of origin (manufacturing) was not Jordan, including those that did not register any country of origin. Within the foreign packs, packs that did not have any of the following mandatory elements were identified as non-compliant: (a) Jordanian QR code, (b) import/production statement, and (c) Jordanian health warning. On the other

hand, some foreign/imported packs are fully compliant if they meet all three of the abovementioned criteria.

Data collection and management

Field activity involved original data collection from a nationally representative sample of households in Jordan by extensively trained enumerators. The project team recruited its field team comprising 30 enumerators from both genders and three supervisors (one for each governorate). All enumerators possessed at least a bachelor's degree and prior experience in survey data collection. Each enumerator was equipped with a tablet or smartphone containing the questionnaire, as well as a vest and cap to clearly identify them as data collectors.

A two-day training session was conducted at suitable locations to orient the field team with the nature of the survey, the survey tool, ethical considerations and other field or interviewing issues. The training aimed to help enumerators understand questionnaires, practice questionnaire completion using the role-play technique, clarify any questions that may arise, and provide tips on how to handle issues encountered during the interviews. A total of 30 households were interviewed by enumerators as part of a feasibility pilot stage. These pilot interviews were conducted in the presence of the senior researchers to mentor the enumerators and provide them with feedback after each interview. While supervisors managed the field teams and operations, the research team conducted the training for the survey and its monitoring. Enumerators were responsible for arranging interviews (either in person or through a phone call, if available).

Ethical considerations

The research protocol was approved by the Institutional Review Board (IRB) of the Jordan University of Science and Technology (JUST), as well as by the IRB of the Jordanian Ministry of Health (MOH). An informed consent in Arabic was sought and signed voluntarily by all participants before the survey interview. This form included information on how collected data will be used to generate knowledge about the tobacco market and how the project findings will be shared with the National Tax Department. The informed consent included a section confirming that participants were requested to show the cigarette packs in their possession and that the survey process required taking photos/images of the cigarette packs.

Statistical analysis

Descriptive statistics were employed to summarize the socio-demographic characteristics of the 463 adult smokers. Means and standard deviations were calculated for continuous variables such as the number of individuals per

household, the number of adult smokers per household, smoking ratios, and ages. The socio-demographic variables were analyzed using frequency distributions to elucidate patterns and differences based on gender. The proportion of smokers purchasing illicit cigarettes was compared across various socio-demographic factors using chi-square tests. To further explore associations between various factors and the likelihood of purchasing illicit cigarettes, multivariate logistic regression analysis was conducted. Lastly, differences in smoking-related behaviors between licit and illicit cigarette purchasers were analyzed. Data were analyzed using IBM SPSS version 24. A p-value of less than 0.05 was considered statistically significant.

Results

Socio-demographic characteristics of adult smokers

Table 1 illustrates the socio-demographic characteristics of adult smokers. Among the 463 participants, the number of adults living in a household range from 1 to 21, with a mean (M) of 4.6 (Standard Deviation/SD=2.4). The number of adult smokers in these households varies from 1 to 8 (M=2.1, SD=1.3). The smoking ratio, representing the proportion of smokers in households with at least one smoker, ranges from 10 percent to 100 percent, with a mean of 49.1 percent (SD=23.5). Participants' ages range from 18 to 74 years (M=32.8, SD=12.0).

The socio-demographic characteristics of 463 adult smokers, comprising 389 males and 74 females, reveal distinct gender-based differences. Among smokers, 59.5 percent of females and 30.8 percent of males are aged 25 years or younger, while 35.5 percent of males and 14.9 percent of females are over 35. A higher proportion of females (58.1 percent are single compared to males, of whom 69.2 percent are married. Regarding education, a significant majority of females (70.3 percent have education beyond high school, whereas only 41.1 percent of males do. Conversely, a greater percentage of males (23.1 percent have less than a high school education compared to females (9.5 percent)[1].

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[1] It is important to mention that these findings do not necessarily align with national-level statistics since this survey included only a sample of smokers who may not represent characteristics of the total population (including non-smokers).

Table 1: Socio-demographic characteristics of adult current smokers						
Variable	Gender				Total, N = 463	
	Male, N = 389		Female, N = 74			
	n	%	n	%	N	%
Age (year)						
≤25	120	30.8	44	59.5	164	35.4
26 – 35	131	33.7	19	25.7	150	32.4
>35	138	35.5	11	14.9	149	32.2
Marital Status						
Single	120	30.8	43	58.1	163	35.2
Ever married	269	69.2	31	41.9	300	64.8
Level of Education						
Less than high school	90	23.1	7	9.5	97	21.0
High school	139	35.7	15	20.3	154	33.3
Higher than high school	160	41.1	52	70.3	212	45.8
Employment						
Full-time	241	62.0	17	23.0	258	55.7
Part-time	97	24.9	29	39.2	126	27.2
Retired	21	5.4	1	1.4	22	4.8
Unemployed	30	7.7	27	36.5	57	12.3
Individual Income (JD)						
<250	110	28.3	40	54.1	150	32.4
250 – 500	256	65.8	32	43.2	288	62.2
>500	23	5.9	2	2.7	25	5.4
Governorate						
AlMafraq	146	37.5	25	33.8	171	36.9
Amman	128	32.9	14	18.9	142	30.7
Irbid	115	29.6	35	47.3	150	32.4
Nationality						
Jordanian	353	90.7	64	86.5	417	90.1
Non-Jordanian	36	9.3	10	13.5	46	9.9

Regarding employment, a larger proportion of males (62.0 percent) are employed full-time, while only 23.0 percent of females hold full-time positions. Conversely, more females are part-time employed (39.2 percent) or unemployed (36.5 percent) compared to males (24.9 percent part-time and 7.7 percent unemployed). Additionally, a higher percentage of females (54.1 percent) earn less than 250 JD per month, whereas most males (65.8 percent) fall within the 250-500 JD income range. Both male (90.7 percent) and female (86.5 percent) smokers are predominantly Jordanian, with

non-Jordanian residents comprising 9.3 percent of male smokers and 13.5 percent of female smokers.

Smoking-related characteristics

The smoking-related characteristics of the 463 participants, shown in Table 2, reveal some notable patterns. Nearly all respondents, both males and females, reported smoking daily. The majority of both male (over 90 percent) and female (over 80 percent) smokers smoke a pack or more daily, with 45.8 percent of males and 43.2 percent of females smoking more than a pack per day. As for the smoking intensity, the mean number of cigarettes smoked per day for males was 26.2 (SD=10.4) compared to 25.1 (SD=11.0) for females.

Table 2: Smoking-related characteristics of adult smokers						
Variable	Gender				Total, N = 463	
	Male, N = 389		Female, N = 74			
	n	%	n	%	N	%
Frequency of smoking						
Less than once a week	1	0.3	0	0.0	1	0.2
One or more per week.	3	0.8	1	1.4	4	0.9
Yes, daily	385	99.0	73	98.6	458	98.9
Number of daily cigarettes (per pack)						
Less than a pack a day	37	9.5	13	17.6	50	10.8
A pack a day	174	44.7	29	39.2	203	43.8
More than a pack a day	178	45.8	32	43.2	210	45.4
Average number of cigarettes per day	26.2 (SD=10.4)		25.1 (SD=11.0)			
Place of last purchase						
Duty-free shop	9	2.3	1	1.4	10	2.2
Grocery store	111	28.5	17	23.0	128	27.6
Out of the country	3	0.8	0	0.0	3	0.6
Street vendor	66	17.0	3	4.1	69	14.9
Supermarket	200	51.4	53	71.6	253	54.6
Payment for pack						
≤1.5	41	10.5	8	10.8	49	10.6
>1.5 – 2.0	152	39.1	25	33.8	177	38.2
>2.0 – 2.5	167	42.9	35	47.3	202	43.6
>2.5	29	7.5	6	8.1	35	7.6

When examining where smokers last purchased their cigarettes, supermarkets were the most common place for both genders (71.6 percent of females and 51.4 percent of males). Grocery stores were also a significant source for male (28.5 percent) and female (23.0 percent) smokers. Male smokers (17.0 percent) used street vendors more commonly than females (4.1 percent).

In terms of payment for a pack of cigarettes, most respondents, both male (42.90 percent) and female (47.30 percent), paid between 2.0 and 2.5 Jordanian Dinars (JD) per pack for their last purchase. Additionally, around one-third of both males (39.10 percent) and females (33.80 percent) paid between 1.5 and 2.0 JD per pack. A smaller percentage paid less than 1.5 JD (10.5 percent of males and 10.8 percent of females).

Use of illicit cigarettes

Table 3 highlights significant differences in the proportion of smokers who purchase illicit cigarettes based on various socio-demographic factors. Overall, 22.2 percent of all smokers bought illicit cigarettes in their last purchase. Males reported a significantly higher rate of illicit cigarette purchases (24.4 percent) compared to females (10.8 percent). Smokers aged 26-35 years were the most likely to buy illicit cigarettes (30.0 percent), whereas those 25 years old or less were the least likely (11.0 percent). Married individuals had a higher tendency to purchase illicit cigarettes (28.0 percent) compared to single individuals (11.7 percent).

Higher education was associated with a greater likelihood of buying illicit cigarettes compared to those with less than a high school education, though this difference was not statistically significant. With respect to employment status, retired individuals had the highest proportion of illicit cigarette purchases (41 percent), while unemployed individuals had the lowest (12 percent). Regarding income, those earning between 250-500 JD were more likely to buy illicit cigarettes (26.0 percent) than those earning less than 250 JD (15.3 percent).

The highest proportion of people purchasing illicit cigarettes was observed in Amman (28.2 percent), followed by AlMafraq (25.1 percent), and the lowest in Irbid (13.3 percent). The effect of nationality on illicit cigarette purchases is statistically non-significant.

| Variable | Purchasing cigarettes | | | | | p-value |
| | Licit | | Illicit | | Total | |
	n	%	n	%	N	
Gender						0.01
Male	294	75.6	95	24.4	389	
Female	66	89.2	8	10.8	74	
Total	360	77.4	103	22.2	463	0.03
Age (year)						<0.001
≤25	146	89.0	18	11.0	164	
26 – 35	105	70.0	45	30.0	150	
>35	109	73.2	40	26.8	149	
Marital Status						<0.001
Single	144	88.3	19	11.7	163	
Ever married	216	72.0	84	28.0	300	
Education Level						0.086
Less than high school	82	84.5	15	15.5	97	
High school	122	79.2	32	20.8	154	
Higher than high school	156	73.6	56	26.4	212	
Employment Status						0.027
Fulltime	195	75.6	63	24.4	258	
Part-time	102	81.0	24	19.0	126	
Retired	13	59.1	9	40.9	22	
Unemployed	50	87.7	7	12.3	57	
Individual Income (JD)						0.037
<250	127	84.7	23	15.3	150	
250 – 500	213	74.0	75	26.0	288	
>500	20	80.0	5	20.0	25	
Governorate						0.005
AlMafraq	128	74.9	43	25.1	171	
Amman	102	71.8	40	28.2	142	
Irbid	130	86.7	20	13.3	150	
Nationality						0.404
Jordanian	322	77.2	95	22.8	417	
Non-Jordanian	38	82.6	8	17.4	46	

Table 3: The proportion of smokers purchasing illicit cigarettes by socio-demographic characteristics

Multivariate analysis of factors associated with the purchase of illicit cigarettes

Table 4 presents the factors associated with buying illicit cigarettes. Being male, married, having a higher education level, and living in AlMafraq or Amman were significant factors associated with the purchase of illicit cigarettes. Males were 2.3 times more likely to buy illicit cigarettes compared to females. Ever-married individuals were 2.8 times more likely to purchase illicit cigarettes than single individuals. Education level showed significant associations as well. Smokers with higher than high school education were 2.7 times more likely to buy illicit cigarettes compared to those with less than high school education. Compared to those in Irbid, residents of AlMafraq were 2 times more likely to buy illicit cigarettes, while residents of Amman were 2.1 times more likely to do so.

Table 4: Factors associated with purchasing illicit cigarettes				
Variable	OR	95% CI		P-value
Gender (male vs. female)	2.3	1.0	5.1	0.043
Marital Status (ever married vs. single)	2.8	1.6	5.0	<0.001
Education Level				
Less than high school	1.0			
High school	1.7	0.8	3.3	0.151
Higher than high school	2.7	1.4	5.1	0.004
Governorate				
Irbid	1.0			
AlMafraq	2.0	1.1	3.6	0.029
Amman	2.1	1.1	3.9	0.018
OR = Odds Ratio, CI = Confidence Interval, P-value = probability value				

Smoking-related characteristics for smokers

Table 5 presents smoking-related characteristics for smokers who bought licit and illicit cigarettes. For the number of daily cigarettes, there was no statistically significant difference between licit and illicit cigarette buyers (p=0.421). Regarding the unit of last purchase, most smokers bought cigarettes in packs rather than cartons, and there was no statistically significant difference between participants who used illicit cigarettes and those who did not (p=0.119). Almost 95.3 percent of licit cigarette buyers purchased packs, compared to 91.3 percent of illicit cigarette buyers. However, the place of last purchase was statistically significant (p<<0.001). Among respondents who bought legal cigarettes, 65.6 percent purchased their packs from supermarkets, while only 16.5 percent of illicit cigarettes were purchased from supermarkets. Street vendors were the main point of purchase for illicit cigarettes, with 64.1 percent of buyers obtaining their illicit cigarettes this way. Grocery stores were also more common for legal cigarette buyers (31.1 percent) compared to illicit buyers (15.5 percent).

Payment per pack showed a statistically significant difference (p<0.001001): 51 percent of legal cigarette buyers paid between 2.0 and 2.5 JD per pack, compared to 18 percent of illicit cigarette buyers. Conversely, 28.2 percent of illicit cigarette buyers paid less than 1.5 JD per pack, compared to only 6 percent of buyers of legal cigarettes.

The number of cigarettes per pack was consistently 20, while the number of packs per carton was consistently 10.

Table 5: Smoking-related characteristics for smokers purchasing licit vs. illicit cigarettes							
	Legality				Total		P-value
	Licit		Illicit				
	N	%	n	%	N	%	
Number of cigarettes smoked daily							0.421
Less than a pack a day	40	11.1	10	9.7	50	10.8	
A pack a day	152	42.2	51	49.5	203	43.8	
More than a pack a day	168	46.7	42	40.8	210	45.4	
Unit of last Purchase							0.119
Carton	17	4.7	9	8.7	26	5.6	
Packs	343	95.3	94	91.3	437	94.4	
Place of last purchase							<0.001
Duty-free shop	9	2.5	1	1.0	10	2.2	
Grocery store	112	31.1	16	15.5	128	27.6	
Out of the country	0	0.0	3	2.9	3	0.6	
Street vendor	3	0.8	66	64.1	69	14.9	
Supermarket	236	65.6	17	16.5	253	54.6	
Payment per pack							<0.001
≤1.5	20	5.6	29	28.2	49	10.6	
>1.5 – 2.0	143	39.7	34	33.0	177	38.2	
>2.0 – 2.5	183	50.8	19	18.4	202	43.6	
>2.5	14	3.9	21	20.4	35	7.6	

Characteristics of licit and illicit cigarettes

Tables 6 and 7 highlight significant differences in the packaging characteristics of licit (compliant) and illicit (non-compliant) cigarettes. The most crucial identification criterion was to identify packs that were taxed. Overall, the data shows that all the packs with QR/stamps also have images of 40% or more, thus considered licit (tax-paid) packs. For the analysis, two separate categories were used to differentiate between licit and illicit packs: 1) Packs with QR/stamps are referred to as licit (tax-paid); 2) Packs without QR/stamps are considered illicit (non-tax-paid). Similarly, packaging compliance is categorized into two categories: 1) Packs with proper warnings and 2) Packs without images/warnings (Table 7).

Table 6: Characteristics of licit and illicit cigarette packs							
	Legality of cigarette packs				Total		P-value
	Licit		Illicit				
	N	%	n	%	N	%	
Official tax stamp visible on the packet (or QR code)							<0.001
It has fragments of the tax stamp, and the origin of the stamp is hard to define	1	0.3	0	0.0	1	0.2	
There is no stamp, and no fragment of the stamp is visible	0	0.0	93	90.3	93	20.1	
The pack has a stamp visible, but this stamp is of another country	0	0.0	10	9.7	10	2.2	
The pack has an official Jordanian visible stamp and/or duty-free stamp	359	99.7	0	0.0	359	77.5	
Health warnings (images or text)							<0.001
Both image & text warning	342	95.0	13	12.6	355	76.7	
None	0	0.0	7	6.8	7	1.5	
Text warning only	18	5.0	83	80.6	101	21.8	
Language of text warning							<0.001
Arabic	346	96.1	22	21.4	368	79.5	
Arabic & English	0	0.0	22	21.4	22	4.8	
English	14	3.9	49	47.6	63	13.6	
Turkish	0	0.0	3	2.9	3	0.6	
None	0	0.0	7	6.8	7	1.5	
Size of warning							<0.001
40%	0	0	3	2.9	3	0.6	
Greater than 40%	360	100	33	32	393	84.9	
Less than 40%	0	0	60	58.3	60	13	
None	0	0	7	6.8	7	1.5	
Are there any health warnings text on the pack?							<0.001
No	342	95.0	20	19.4	362	78.2	
Yes	18	5.0	83	80.6	101	21.8	

Regarding the visibility of the official tax stamp, 99.7 percent of licit cigarette packs had a visible official tax stamp from Jordan and duty-free shops, and 0.3 percent had fragments of a tax stamp and were thus considered licit. Also, all illicit packs had neither the Jordanian tax stamp nor the duty-free stamp. Ninety percent of these illicit packs had no visible stamp while the rest had another country's stamp; in other words, none of the illicit cigarette packs had the official Jordanian stamp or the QR code printed on them. It is important to note that in this study, all duty-free packs were considered licit (except one with no stamp), as they had the duty-free stamp. On the other hand, there were 93 packs with no Jordanian stamp, and 10 had stamps from

another country (not from the duty-free shops) but illegally. All these 10 packs were purchased from grocery stores, supermarkets and street vendors) and they don't have a stamp of a duty-free shop.

For health warning images, 95 percent of licit cigarette packs with the correct tax stamp displayed proper health warning images. In contrast, only 5 percent had the official Jordanian tax stamp but were labelled non-compliant as they only had text warnings without images. While these packs are tax-paid, they have been labelled non-compliant as they do not have proper warnings required by Jordanian law. The source of these packs is duty-free shops. Conversely, only about 13 percent of illicit cigarette packs displayed proper health warning images, whereas 87.4 percent had no proper health warnings (81 percent had only text warnings, and nearly 7 percent had neither images nor text warnings).

Table 7: Categorization of licit and illicit cigarette packs					
			Image size		
		No image	<40%	≥40%	Total
Sample (numbers)					
Stamp/QR	Yes	0	0	360	360
	No	7	59	37	103
Percentage distribution					
Licit (tax-paid)		0.0	0.0	77.5	77.8
Illicit (non-tax-paid)		1.5	13.0	8.0	22.2
Compliant packaging				85.5	85.5
Non-compliant packaging		1.5	13.0		14.5

The language of the text messages on the pack also differed significantly (p=<0.001). On licit packs, 96.1 percent of text warnings were in Arabic, the official language by law. The remaining licit packs had text warnings in languages other than Arabic as they were produced outside Jordan and purchased directly or indirectly from duty-free shops. On the other hand, nearly 48 percent of illicit packs displayed text warnings in English. As for packs bought directly from duty-free shops, the language of the text warning is the official language of the producing country.

Regarding the health warnings, all licit packs had warnings covering more than 40 percent of the pack compared to only 31.1 percent on illicit packs. The average prices of illicit and licit packs are not very different, but the range varies significantly. Overall, the average price was JD 2.14, with a range of JD 0.3 to 4.5. The average purchase price of illicit and licit packs was JD 2.13 (Range: 0.3-4.5) and JD 2.15 (Range: 1.15-4.5), respectively.

Brands of cigarettes

Table 8 shows that Winston was the most popular cigarette brand, used by almost one-fifth of the respondents, followed by LD and Marlboro (Normal), both at 12 percent. Other common brands include L&M (11.4 percent), Kent (10.2 percent), and Gold Coast (7.6 percent). Several brands, such as Captain Black, Elegance, and Anderson, had lower market shares, each under 3 percent. Brands like Royal, Akhtamar, Davidoff, and Marlboro Double Mix each had a presence of around 1 percent, while lesser-known brands such as 500 Ecce, Berlin, and Maddox each made up less than half a percent of the total. "Others" accounted for 6 percent of the cigarette brands (Table 8).

Table 8: Categorization of licit and illicit cigarette packs				
Brand	N	%	Legality N (%)	
			Licit	Illicit
Winston	92	19.9	91 (98.9)	1 (1.1)
LD	57	12.3	56 (98.2)	1 (1.8)
Marlboro (Normal)	57	12.3	46 (80.7)	11 (19.3)
L&M	53	11.4	52 (98.1)	1 (1.9)
Kent	47	10.2	43 (91.5)	4 (8.5)
Gold Coast	35	7.6	35 (100)	0 (0)
Captain Black	11	2.4	11 (100)	0 (0)
Elegance	10	2.2	6 (60)	4 (40)
Anderson	9	1.9	7 (77.8)	2 (22.2)
Royal	7	1.5	6 (85.7)	1 (14.3)
Akhtamar	5	1.1	0 (0)	5 (100)
Davidoff	5	1.1	3 (60)	2 (40)
Marlboro Double Mix	5	1.1	5 (100)	0 (0)
Parliament	5	1.1	3 (60)	2 (40)
Cedars	4	0.9	0 (0)	4 (100)
Dunhill	4	0.9	2 (50)	2 (50)
Alhamra	3	0.6	0 (0)	3 (100)
Desperado	3	0.6	0 (0)	3 (100)
Miami	3	0.6	3 (100)	0 (0)
500 ecce	2	0.4	0 (0)	2 (100)
Berlin	2	0.4	0 (0)	2 (100)
Blaq	2	0.4	0 (0)	2 (100)
Elegance Black	2	0.4	0 (0)	2 (100)
Elegance Max	2	0.4	0 (0)	2 (100)
Gaulioses Compact	2	0.4	0 (0)	2 (100)
Maddox	2	0.4	0 (0)	2 (100)
Marlboro (Touch)	2	0.4	2 (100)	0 (0)
Milano	2	0.4	0 (0)	2 (100)
Oris	2	0.4	0 (0)	2 (100)
Others	28	6	0 (0)	6 (100)

Discussion

The findings of this study offer valuable insights into the socio-demographic characteristics, smoking behaviour, and the use of illicit (non-compliant) cigarettes among adult smokers in Jordan, with a focus on non-tax-paid cigarettes. The relatively high incidence of illicit cigarette trade could undermine public health efforts, which are significant within the context of Jordan's high smoking prevalence. While our findings demonstrate no significant difference in the average purchase price between licit and illicit trade, the lower range varies significantly as the cheapest illicit cigarettes are significantly less expensive than the cheapest licit ones.

Socio-demographic characteristics of smokers

The socio-demographic characteristics of the participants highlight distinct gender and age patterns in smoking behaviour. The study reveals notable gender and age disparities among smokers. The predominance of male smokers (84 percent) is consistent with existing literature, as smoking has traditionally been more socially acceptable among men in Jordan. However, the high percentage of young female smokers (almost 60 percent of those 25 years old or younger) is concerning, reflecting a potential shift in social norms and increased exposure and access to smoking among women [23]. This trend is consistent with global patterns where younger women are increasingly targeted by tobacco marketing [24, 25].

The gender differences in education and employment revealed in this study are also informative. More female smokers reported education beyond high school (70.3 percent) compared to males (41.1 percent). Additionally, women were less likely to be employed full-time (23.0 percent compared to 62.0 percent of males), reporting their status either as unemployed or working part-time, suggesting that women may smoke as a coping mechanism for economic stress [26].

Smoking behaviors

Daily smoking is associated with higher levels of nicotine dependence and may indicate a long-term pattern of use, which can complicate cessation efforts. Over 40 percent of both men and women surveyed reported smoking more than a pack of cigarettes per day. This is particularly concerning from a public health perspective, as high levels of consumption are linked to a range of adverse health outcomes, including an increased risk of cardiovascular disease, respiratory issues, and various cancers. Understanding that the majority of smokers are daily users who consume high quantities of cigarettes highlights the need for targeted smoking cessation programs.

This reflects the deep-rooted smoking culture in Jordan, where cigarette smoking in high quantities is among the highest globally [3, 27](WHO, 2021). Hence, the financial burden

on smokers is significant as they pay between JD 2.13 and 2.15 per pack, especially in the case of women, who reported earning less than 250 JD per month. Smoking may exacerbate financial stress, particularly among low-income individuals, pushing them to switch towards cheaper alternatives. Interventions focusing on addressing nicotine dependence and the socioeconomic or environmental factors are likely to be more effective if combined with tax increases, which have globally proven to be the most effective policy measure to reduce tobacco consumption.

Use of non-compliant/illicit cigarettes

The current findings highlight the significant issue of illicit cigarette trade in Jordan, with almost a quarter (22.2 percent) of respondents reporting purchasing illicit cigarettes. This finding is consistent with previous research, which has shown that Jordan has one of the highest rates of illicit cigarette trade in the region [6, 13]. The higher likelihood of individuals aged 26-35 years (30.0 percent) purchasing illicit cigarettes suggests that younger adults in this age group may be more likely to engage in this behaviour. Illicit cigarettes can be easily accessed by men. Street vendors often serve as a source of cheaper, illicit cigarettes, bypassing formal retail outlets and tax regulations. While some studies indicate that illicit cigarette use rises in response to price hikes [28]. It has been demonstrated that in countries that invest in their tax administration and effectively secure the tobacco supply chain, the illicit industry does not increase significantly when prices do. For example, strong licensing regimes and properly functioning track and trace systems, paired with effective enforcement and judicial engagement, are key components of systems securing the supply chain.

In our study, this was true only in a few cases (6) in which the respondents reported purchasing illicit cigarette packs for as low a price as JD 1. However, there were cases where illicit packs were purchased for prices as high as JD 4.5, highlighting that some illicit brands are very expensive compared to average licit packs (almost double the average price). Thus, a nuanced approach is necessary when examining the motivations behind purchasing illicit cigarettes and the effects of tax increases on this specific consumer group.

The study also reveals that married individuals and those with higher education levels were more likely to purchase illicit cigarettes, which is consistent with previous literature [29-31]. Married individuals may also experience different social norms and peer influences that affect their smoking behaviour. The finding that individuals with higher education levels are more likely to purchase illicit cigarettes might seem counterintuitive, as higher education is typically associated with increased health awareness and better economic prospects.

Geographical disparities were also evident, with smokers in AlMafraq more likely to buy illicit cigarettes compared to those in Irbid and Amman. This could be due to the proximity of AlMafraq to smuggling routes and the availability of illicit cigarettes in this governorate

serving as key hubs for the distribution of smuggled tobacco products, where illicit markets are more prevalent [29, 32].

Another key finding of this study is the significant differences between compliant (licit) and non-compliant (illicit) cigarette packs regarding tax stamps and health warnings, highlighting gaps in controlling the illicit tobacco market. The lack of official Jordanian tax stamps on illicit cigarette packs in this survey indicates that these tobacco products are either smuggled or manufactured without the government's knowledge and regulation. This reduces government revenue from tobacco taxes, which are a fundamental funding source for public health initiatives [32-34] .

Additionally, the absence of health warnings on most illicit cigarette packs revealed in this survey poses a serious public health risk in Jordan. Previous research affirmed that graphic health warnings are effective in discouraging smoking, particularly among youth and smokers with low-income [35-37]. The widespread availability of illicit cigarettes without these warnings may reduce the effectiveness of public health campaigns aimed at reducing smoking rates in the country.

Brand preferences and market dynamics

The domination of brands such as Marlboro, Winston, L&M, and LD in both licit and illicit markets is consistent with trends worldwide, as these brands are among the most widely smoked [38]. However, the presence of less famous brands, particularly among illicit cigarette smokers, suggests that the illicit market may be populated by smuggled products. Having said that, besides the illicit market, the emergence of clandestine local factories producing cigarettes could also be a reason for cheaper brands in the Jordanian market. Nonetheless, the availability of cheaper brands may make such cigarettes more appealing to price-sensitive smokers, further hindering efforts to reduce smoking through price increases and taxation [28, 29].

Recommendations

Raising taxes on cigarettes is the most effective and cost-effective intervention available to policymakers to drive down smoking and raise excise tax revenues. Specifically, the tax should be a uniform specific excise tax that is raised regularly to outpace inflation and economic growth, thereby driving up prices and ensuring that there are no inexpensive cigarettes on the market. However, these tax increases must be paired with efforts to secure the cigarette supply chain. Preventing the illicit cigarette trade requires a multifaceted approach that addresses the underlying factors contributing to illicit sales and consumption. Based on this analysis, the following approach is recommended:

1. Implement and enforce stricter penalties for producing, distributing, and/or selling illicit tobacco products. This can be achieved by the development, strong implementation and enforcement of a comprehensive track and trace system that is independent of any industry influence. Use the data from these monitoring systems to identify and act upon trouble spots in the supply chain.

2. Institute transparent enforcement and judicial parameters to ensure that smugglers and illicit producers are caught and adequately punished.

3. Conduct regular inspections of retail outlets to ensure compliance with tobacco laws and regulations. An additional effective measure is to license all tobacco retailers and revoke any licenses of retailers who are caught selling illicit products.

4. Enhance access to smoking cessation resources, such as counselling, support groups, and cessation medications, making them available through various channels, including healthcare providers and community organizations.

5. Collect and analyze data on tobacco use trends, including the prevalence of illicit tobacco, to inform policy and program development.

6. Develop targeted interventions aimed at youth and young adults, who may be more likely to engage in illicit tobacco use, to raise awareness about the dangers of overall tobacco consumption and discourage participation.

The findings of this study highlight the pressing need to tackle the high smoking prevalence in Jordan. Furthermore, the study reveals some challenges with a sizeable illicit market—according to the smoker survey we implemented, 22.2 percent of smokers bought illicit cigarettes in their last purchase. A lack of a strong regulatory framework to secure the supply chain is likely the largest contributor to the problem. The lack of health warnings on illicit cigarette packs undermines public health and packs on which no excise tax is paid result in substantial tax revenue loss for the government.

By addressing the root causes of illicit trade and high smoking prevalence, Jordan can reduce tobacco consumption, improve public health, and enhance tax revenues, aligning with its National Tobacco Control Strategy for 2024-2030.

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