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# A Comparative Assessment of the Price, Brands and Pack Characteristics of Illicitly Traded Cigarettes in Five Cities and Towns in South Africa



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| Complete List of Authors: | Wherry, Anna; Johns Hopkins University, Kreiger School of Arts and Sciences<br>McCray, Cheyenne; Johns Hopkins University, Kreiger School of Arts and Sciences<br>Adedeji-Fajobi, Temidayo; Johns Hopkins University, Kreiger School of Arts and Sciences<br>Golub, Jonathan; Johns Hopkins University, School of Medicine<br>Cohen, Joanna; Johns Hopkins Bloomberg School of Public Health, Department of Health, Behavior and Society; Johns Hopkins Bloomberg School of Public Health, Institute for Global Tobacco Control<br>Martinson, Neil; University of the Witwatersrand, Perinatal HIV Research Unit; Johns Hopkins Bloomberg School of Public Health, Institute for Global Tobacco Control |
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**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies***

| Section/Topic | Item # | Recommendation | Reported on page # |
|---|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract | 2 |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| **Introduction** | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 4 |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | 4 |
| **Methods** | | | |
| Study design | 4 | Present key elements of study design early in the paper | 4-7 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 7-8 |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants | 6-7 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 4-8 |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 8 |
| Bias | 9 | Describe any efforts to address potential sources of bias | 4-8 |
| Study size | 10 | Explain how the study size was arrived at | 5-6 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 8 |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | 8 |
| | | (*b*) Describe any methods used to examine subgroups and interactions | 8 |
| | | (*c*) Explain how missing data were addressed | 13 |
| | | (*d*) If applicable, describe analytical methods taking account of sampling strategy | n/a |
| | | (*e*) Describe any sensitivity analyses | n/a |
| **Results** | | | |

| | | | |
|---|---|---|---|
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 6,11 |
| | | (b) Give reasons for non-participation at each stage | 12 |
| | | (c) Consider use of a flow diagram | n/a |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 12 |
| | | (b) Indicate number of participants with missing data for each variable of interest | n/a |
| Outcome data | 15* | Report numbers of outcome events or summary measures | 9-12 |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | 9-12 |
| | | (*b*) Report category boundaries when continuous variables were categorized | n/a |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | n/a |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | n/a |
| **Discussion** | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 12-13 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 12 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 13 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 12-13 |
| **Other information** | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 14 |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

# A Comparative Assessment of the Price, Brands and Pack Characteristics of Illicitly Traded Cigarettes in Five Cities and Towns in South Africa

**Anna E. Wherry*[1], Cheyenne A. McCray*[1], Temidayo I. Adedeji-Fajobi[1], Xolani Sibiya[2], Peter Ucko[3], Limakatso Lebina[2], Jonathan E. Golub[6], Joanna E. Cohen[4,5], Neil A. Martinson[2,5],**

1. Kreiger School of Arts and Sciences, Johns Hopkins University, Baltimore, MD, USA
2. Perinatal HIV Research Unit, University of the Witwatersrand, Johannesburg, South Africa
3. National Council Against Smoking, Johannesburg, South Africa
4. Department of Health, Behavior and Society, Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD, USA
5. Institute for Global Tobacco Control, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA
6. Johns Hopkins University School of Medicine, Center for Tuberculosis Research, Baltimore, MD, USA

* Both authors contributed equally

**Corresponding Author:**
Dr. Neil Martinson
PO Box 114
Diepkloof 1864
South Africa
Tel: +27119899836
Fax: +27119899762
Email: martinson@phru.co.za

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## ABSTRACT

***Objectives***: The prevalence of illicitly traded cigarettes in South Africa has been reported to be 40-50%. However, these estimates do not account for the more nuanced characteristics of the illicit cigarette trade. With the goal of gaining a better understanding of contraband cigarettes in South Africa, this study piloted three methods for assessing the price, brands, pack features, and smoker's views about illicit cigarettes in five cities/towns: Johannesburg, Durban, Nelspruit, Musina, and Ficksburg.

***Setting***: A convenience sample of towns and cities was selected for this pilot study. Three South African cities (Johannesburg, Durban, and Nelspruit) and two smaller towns (Musina, and Ficksburg) were chosen. The locations were selected for their quality as potential "hot spots" for illicit cigarette trade, ensuring the presence of ample cigarette vendors and pedestrian traffic. The localities we selected and their local taxi ranks represent specific micro-economies and therefore cannot be considered representative of the entire city/town let alone South Africa as a whole.

***Participants:*** For the purposes of the survey, 40 self-reported smokers were recruited at taxi ranks in each downtown site. Adults aged 18 and over were approached and asked if they were smokers. All individuals over the age of 18 who reported smoking were asked to verbally consent to participate in the study and answer a questionnaire administered by a researcher.

***Primary and secondary outcome measures:*** Three cross-sectional approaches were used to assess the characteristics of contraband cigarettes: (1) a dummy purchase of cigarettes from informal retailers – both roadside hawkers and informal small shops known as spaza shops; (2) the collection of discarded cigarette packs; and, (3) a survey of tobacco smokers. In each city/town, 30 informal retailers (20 street vendors and 10 spaza shops) were sampled, at least 100 discarded cigarette packs were collected and categorized according to legislated packaging requirements, and 40 tobacco smokers were surveyed.

***Results***: The leading reason for labeling a pack as illicit in each city/town was the absence of an excise stamp (28.6% overall), and the least common reason was an illegal tar or nicotine level (11.1% overall). Overall proportions of street vendors (spaza shops and street vendors) who sold illicitly traded cigarettes was 41%, with a range from 80% (Nelspruit) to 0% (Ficksburg). Singles and packs of 20 were

consistently cheaper at both street vendors and spaza shops. Survey participants' responses reflected varied perspectives on illicit cigarettes and purchasing preferences.

***Conclusion***: Each approach generated interesting insight into the physical aspects of illicit cigarettes. Specifically, the dummy purchase of cigarettes from informal retailers generated useful information on pricing and availability of illicit cigarettes. Collection of cigarette packs allowed for an analysis of the brands and packaging features. Surveys of tobacco smokers provided first hand accounts on the use and purchasing habits of legal and illicit cigarettes among smokers. While this pilot study cannot be used to generate generalizable statistics on illicit cigarettes, more systematic surveys of this nature could inform researchers' and practitioners' initiatives to combat legal and illicit cigarette sales and usage. Future studies could also assess the feasibility of this approach when used in other countries and settings.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- **Strengths:**
  - The three methods required little time and resources to conduct.
  - The dummy purchase of cigarettes offered beneficial understanding of local channels of availability, specifically through spaza shops and street vendors.
  - The collection of discarded cigarette packs provided insight into the distribution of illicitly traded brands in the different sample locations.
  - The consumer survey provided anecdotal accounts of smokers' perceptions regarding illicitly traded cigarettes, such as how they were perceived to cause more severe cough.
- **Limitations**:
  - As the pilot study is restricted to only small non-randomly selected sites, the data must be understood as illustrative of five specific micro-economies and social networks. The data thus cannot be considered representative of South Africa as a whole, nor used to make countrywide inferences.

- The selection of study sites lead to demographic specificity; the respondents to our smokers survey were almost all Black men, and are not representative of either the smoking or overall population of South Africa.
- The survey was restricted to informal businesses and does not capture data on volumes of sales, or of the sale of illicitly traded cigarettes by formal vendors of tobacco products in South Africa.
- Both researchers and respondents may not have always correctly categorized illicitly traded cigarettes by price and packaging – especially those illicit packages that might have expertly mimicked legal packaging requirements.
- Some survey respondents were reluctant to respond to questions specifically dealing with illicitly traded cigarettes and some potential respondents who denied smoking were subsequently seen to be smoking.

**BACKGROUND**

The widespread availability of cheaper contraband or illicit cigarettes in South Africa has been touted to undermine national tax efforts to reduce smoking through increasing the price the consumer pays for tobacco products [1-6]. The World Health Organization Framework Convention on Tobacco Control (FCTC) includes provisions to address illicit trade in tobacco products and, in November 2012, the delegates of more than 140 Parties to the FCTC adopted a new international protocol for combating illicit trade [7]. Illicit trade in tobacco products is defined in Article 1 of FCTC as "any practice or conduct prohibited by law and which relates to production, shipment, receipt, possession, distribution, sale or purchase including any practice or conduct intended to facilitate such activity" [8].

There are concerns that recent gains in tobacco control in South Africa may be reduced or even counteracted due to the illicit trade of cigarettes from neighboring countries [9]. News reports describing cigarette "runners" crossing the Zimbabwe border – the 6th largest tobacco exporter globally [10] – suggest they carry an average of ZAR 12,900 [~USD 1,300] worth of illicitly traded cigarettes per run [11-13]. These reports have been utilized by the South African tobacco industry to argue against further

increases in excise taxes, [14] using advertising campaigns against the purchase of illicit cigarettes [15]. Tobacco company funded research suggests that 19 million cigarettes are sold illegally every day and that illicit trade in tobacco products comprises 30% of the total market share [16] with an estimated prevalence of illicit cigarettes in South Africa to be 40-50% [17].

Currently, there is little known beyond these statistics regarding the characteristics of these cigarettes. In this pilot study, we implemented and compared three methods that evaluate price, types of cigarettes, pack features, and smoker's perceptions of illicit cigarettes in five locations in South Africa.

## METHODS

Criteria for categorizing cigarette packs into "likely illicitly traded cigarettes" and "legal" were based on the 1993 South African Tobacco Products Control Act 83 [18], which stipulates that packs must have a visible South African excise stamp; correct and corresponding health warning labels must be appropriately sized and placed on both the front and back of the pack (there are 8 allowed labeling messages); the South African smoking information telephone number (the National Quit Line: +27117203145) must be printed on the back of the pack; and tar and nicotine content must not exceed 12 mg and 1.2 mg, respectively [18]. Given the excise tax on cigarettes in South Africa, the selling price of single cigarettes and a pack of 20 cigarettes must be at least ZAR 1.5 [~USD 0.15] and ZAR 13.50 [~USD 1.36], respectively [18].

Three approaches were selected and piloted after discussions with local experts in tobacco control, and after investigating the feasibility of implementation. None of the methods in this study required purchase of tobacco products.

### 1. Dummy purchase of cigarettes from informal vendors

Two groups of informal cigarette vendors were included: (1) hawkers or street vendors located close to large taxi ranks, and (2) micro-enterprises or "spaza shops", which are small grocery stores usually located in the yard or house of a private dwelling in large townships or dormitory towns serving the city of each study site. Both spaza shops and street vendors are informal businesses operating with little regulatory oversight and may be more likely to sell illicitly traded goods than a formal supermarket

or shop. Street vendors displayed most of what they had for sale in open sight on tables that lined curbsides of streets, allowing customers to browse easily. Spaza shops kept what they had for sale behind glass windows and conducted business through open windows. Their informal quality thus provides an opportunity to observe how contraband cigarettes are traded and sold. The dummy cigarette purchases were also designed to ascertain the price of legal and potentially illicitly traded brands of cigarettes sold on the streets in the city center (for street vendors) and within residential areas (for spaza shops).

Twenty street vendors and ten spaza shops were surveyed in each city/town. Data were not collected from those vendors nearest to immigration or customs officials to avoid potential legal problems. Two researchers conducted each dummy cigarette purchase; one asked for cigarettes while the other reviewed the different brands available. Based on the brands observed and prices given, if no illicitly traded cigarettes were perceived to be offered for sale, the team would ask the vendor for a cheaper cigarette for less than ZAR 2.00 [~USD 0.24]. Cigarette packaging was observed for legislative requirements to ascertain legality. After examining each brand and determining the cheapest legal and the cheapest illicitly traded cigarette, if available, the researchers would depart and immediately complete a case report form (CRF) which included: presence of cigarettes in packs of 10, packs of 20, or as singles; whether or not illicitly traded cigarettes were observed to be available for purchase; the price of the cheapest legal and cheapest illicitly traded cigarettes, if available, sold in packs of 10, packs of 20, and as singles. Spaza shop visits followed a similar pattern of data collection, except that it was necessary to drive around the local township until a spaza shop was found. Additionally, in spaza shops the team recorded the presence or absence of legally required signs prohibiting the sale of cigarettes to individuals younger than 18 years.

**2. Discarded cigarette packs**

At least 100 discarded cigarette packs were collected per city/town. The packs collected were found in refuse bins or as litter picked up from sidewalks and gutters, on both sides of the street, within five city blocks of a large taxi rank in each downtown site. The final number of blocks or total length of

streets where packs were collected depended on the local street layout and perceived safety of the team. Any visible empty cigarette packs that were not soiled and had legible writing were collected. Gloves were used to pick up the cigarette packs and place them into sealed labeled bags. The collected discarded cigarette packs were later categorized according to the study definitions (see pg. 2) as illicitly traded or legal.

**3. Smokers survey**

Forty self-reported smokers were recruited at taxi ranks in each downtown site. Adults aged 18 and over were approached and asked if they were smokers. All individuals who reported smoking were asked to verbally consent to participate in the study and answer a questionnaire administered by a researcher. The survey contained basic demographic questions; questions regarding smoking behaviors; as well as questions to ascertain the use of illicitly traded cigarettes, such as brands usually smoked and prices paid for packs of cigarettes and single cigarettes. Participants were also asked if the user ever purchased contraband cigarettes. Finally, participants were asked how they were able to distinguish between legal and contraband cigarettes, and were provided the opportunity to share their personal views on contraband cigarettes Contraband cigarettes were defined as cigarettes that the participant believed to be illegal or "fongkong," a colloquial term referring to cigarettes traded illicitly. Surveys were conducted in the language of choice of the respondent, and took approximately 10 minutes to complete. Two hundred surveys were completed, 40 in each city/town. After the survey was completed, participants were provided with smoking cessation information if requested.

**Study Sites**

A convenience sample of towns and cities was selected for this pilot study. Three South African cities (Johannesburg, Durban, and Nelspruit) and two smaller towns (Musina, and Ficksburg) were chosen. The locations were selected for their quality as potential "hot spots" for illicit cigarette trade, ensuring the presence of ample cigarette vendors and pedestrian traffic. The localities we selected and their local

taxi ranks represent specific micro-economies and therefore cannot be considered representative of the entire city/town let alone South Africa as a whole [8].

Three of the sites (Nelspruit, Ficksburg and Musina) were specifically selected for their proximity to countries neighboring South Africa. Each city's or town's largest minibus taxi rank was chosen as the primary hub of the survey due to the universal use of taxi transport by commuters in South Africa. Areas adjacent to taxi ranks in cities and towns in South Africa have a predictably high volume of pedestrian traffic accessing taxi ranks as well as a high density of informal street vendors selling to commuters. *Nelspruit* was selected due to its proximity to both Swaziland and Mozambique. Nelspruit's taxi rank, located on Andrew Street, was used for the study, and spaza shop vendors were selected from the largest residential township in Nelspruit: Kanyamazane. *Musina* was selected due to its proximity to Zimbabwe, the 6th largest tobacco leaf exporter in the world [10]. The taxi rank is located on N1 highway and data collection for the spaza shop vendors was conducted in two of the largest neighboring residential townships in Musina: Freedompark and Niceville. Two townships were used in Musina due to its relatively smaller residential areas in comparison to the other townships in the study. *Ficksburg* is located on the border with Lesotho. The taxi rank on Bloem St is about 200m from and within eyesight of the South African border control post. Data collection for the spaza shop vendors was conducted in the largest residential township in Ficksburg: Meqheleng. *Durban* is the largest seaport serving southern Africa. Cross Street taxi rank was selected for surveys of smokers and of street vendors. The township of Phoenix was selected to identify spaza shops. *Johannesburg* is the economic hub of South Africa. The Noord Street Taxi Rank in downtown Johannesburg was selected to identify smokers and street vendors, and the survey of spaza shop vendors was conducted in Soweto, South Africa's largest residential township. Data collection was conducted in June and July 2012. Each city/town required three to four days to complete study procedures except Ficksburg, which owing to its size and ease of interviews, was completed in just one day.

**Analysis**

Data were stratified by locality and subsequently used to determine the characteristics of illicitly traded cigarettes presented by each methodology. Specifically, the analysis isolated data on: the average prices of contraband cigarettes versus legal cigarettes; the distribution of contraband and legal brands by location; the reasons for classifying a discarded cigarette pack as illicitly traded; the proportion of collected discarded cigarette boxes classified as likely contraband; the proportion of sample vendors selling illicitly traded cigarettes; and the proportion of survey participants who reported ever purchasing contraband cigarettes. Epi Info 7 and R statistical tool software were used to analyze the data. Institutional review boards of the Johns Hopkins University and the University of the Witwatersrand approved the survey of self-reported smokers.



## RESULTS

Data collection was from June 2012 to July 2012. The team did not encounter problems implementing any of the study procedures. In the following section the results are presented according to methodology.

### Dummy purchase of cigarettes from informal vendors

In Johannesburg, Durban and Nelspruit, vendors appeared to freely provide data on price and sales of illicitly traded cigarettes. However, Musina and Ficksburg were characterized by a reluctance to offer illicit cigarettes. For instance, when asked, many street vendors in Musina said, “go to Zimbabwe.” Overall, the proportion of street vendors who sold illicitly traded cigarettes was 41% with a range from 80% in Nelspruit to 0% in Ficksburg (Table 1). Over half (54%) of spaza shops sold illicitly traded cigarettes with a range of 70% in Nelspruit and Johannesburg to 20% in Musina.

**Table 1: Proportion of spaza shops and street vendors selling illicitly traded cigarettes**

| | Johannesburg | Durban | Nelspruit | Musina | Ficksburg | Total |
|---|---|---|---|---|---|---|
| Spaza Shop | n=10; 70% | n=10; 60% | n=10; 70% | n=10; 20% | n=10; 50% | n=50; 54% |
| Street Vendor | n=20; 70% | n=20; 30% | n=20; 80% | n=20; 25% | n=20; 0% | n=100; 41% |
| Total | n=30 70% | n=30; 40% | n=30; 77% | n=30; 23% | n=30; 23% | n=150, 45% |

The average retail price of a box of 20 "legal" cigarettes was ZAR 30.79 at spaza shops and ZAR 28.00 at street vendors, whereas the price of illicitly traded packs of 20 cigarettes was ZAR 16.31 and ZAR 13.78 at spaza shops and street vendors, respectively. Similarly "legal" singles retailed at ZAR 1.99 and ZAR 2.13 at spaza shops and street vendors, respectively, whereas illicitly traded singles typically retailed at ZAR0.95 and 0.93 ZAR. Only 16.3% of spaza shops displayed government warnings prohibiting the sale of cigarettes to minors and 10.0% possessed formal advertising stands for cigarettes. No counterfeit packages of established legal brands were observed, although it is possible that illicit packages for these brands successfully reproduced all legal criteria.

**Table 2: Average retail price of legal versus illicityl traded single cigarettes and packs of 20 at spaza shops and street vendors**

| **Single Cigarettes** | | | | | | |
|---|---|---|---|---|---|---|
| | Johannesburg | Durban | Nelspruit | Musina | Ficksburg | Total |
| Legal | ZAR 1.90 | ZAR 1.97 | ZAR 2.00 | ZAR 2.31 | ZAR 2.26 | ZAR 2.08 |
| Illicitly traded | ZAR 0.85 | ZAR 0.96 | ZAR 1.08 | ZAR 0.6 | ZAR 1.06 | ZAR 0.93 |
| **Packs of 20** | | | | | | |
| Legal | ZAR 30.53 | ZAR 27.71 | ZAR 25.05 | ZAR 31.25 | ZAR 29.00 | ZAR 29.34 |
| Illicitly traded | ZAR 15.15 | ZAR 13.8 | ZAR 15.42 | ZAR 11.00 | ZAR 18.83 | ZAR 14.82 |

**Collection of discarded cigarette packs**

Of 558 packs collected from streets, trash piles, bins and gutters, 147 were determined to be illicit (26.3%; 95%CI 22.8, 30.2). The city/town with the highest proportion of discarded illicitly traded cigarettes at the sample sites was Musina (56.3% of all boxes collected) and the site with the lowest proportion was Ficksburg (2.4% of all boxes collected).

The top five brands of discarded cigarette packs categorized as illicit according to study definitions were Remington Gold (43), Safari (29), Dullahs (18), Pacific Blue (16), and Aspen (11) (Table 3). The frequency of illicit brands varied greatly by city/town.

Overall, the leading reasons for classifying a discarded cigarette pack as illicit in descending order were: absence of an excise stamp (28.6%), incorrect or missing health warnings (26.9%), absence of the National Quit Line number (25.9%), tar or nicotine level that was missing or higher than allowed (13.6% and 11.1%, respectively). At least one of these criteria was inadequate or missing in 28.6% of discarded cigarette packs.

**Table 3: Most frequently discarded illicitly traded brands, by city/town**

| | Brand | Number | Proportion among illicitly traded cigarettes | Proportion among all cigarettes collected |
|---|---|---|---|---|
| Johannesburg | Dullahs<br>Remington Gold<br>Grande Turismo<br>Mega 20<br>Kingsgate<br>Pacific Blue | 16<br>9<br>4<br>4<br>2<br>2 | 43%<br>24%<br>11%<br>11%<br>5%<br>5% | 14%<br>8%<br>3%<br>3%<br>2%<br>2% |
| Durban | Pacific Blue<br>Aspen<br>Mega 20<br>Pall Mall<br>Ransom | 13<br>11<br>2<br>1<br>1 | 46%<br>39%<br>7%<br>4%<br>4% | 10%<br>9%<br>1%<br>1%<br>1% |
| Nelspruit | Safari<br>Pall Mall | 29<br>1 | 97%<br>3% | 29%<br>1% |
| Musina | Remington Gold<br>Madison<br>Dullahs<br>Everest<br>Marlboro | 34<br>10<br>2<br>1<br>1 | 69%<br>20%<br>4%<br>2%<br>2% | 39%<br>12%<br>2%<br>1%<br>1% |

| | | | | |
|---|---|---|---|---|
| | Mega 20 | 1 | 2% | 1% |
| Ficksburg | Pacific Blue<br>Pall Mall<br>Sasha | 1<br>1<br>1 | 33%<br>33%<br>33% | 1%<br>1%<br>1% |

**Smokers survey**

Almost all (98.5%) survey participants identified as male and virtually all (97.5%) identified as black South African. The median number of cigarettes smoked was 14 per day. Most respondents (72.1%) reported they usually purchased single cigarettes. 71.1% reported only purchasing legal cigarettes whereas 27.4% reported purchasing both legal and illicitly traded and 1.5% reported exclusively purchasing illicitly traded cigarettes. Participants reported paying an average of ZAR 2.20 for single cigarettes and ZAR 26.6.

The most frequently reported illicitly traded cigarettes purchased by participants were Madison (11reports) and Remington Gold (10 reports). Respondents were asked to describe how they distinguished a "fongkong" or contraband cigarette from a legal cigarette. The three most commonly reported explanations were due to "fongkong" cigarettes having adverse effects on the body, such as causing cough (38); differences in taste (30); and physical differences in the cigarette or packaging (27). Branding was also reported as an indicator of contraband 15 times. Several participants (14) reported not knowing how to distinguish between contraband and legal cigarettes.

**DISCUSSION**

This pilot study utilized three methods to investigate the characteristics of illicitly traded cigarettes in five "hot spot" locations across South Africa. Specifically, information was generated on differences in pricing, types of brands, characteristics of illicit packaging, and perceptions on the use of contraband cigarettes among smokers.

As the pilot study is restricted to only small non-randomly selected sites, the data must be understood as illustrative of five specific micro-economies and social networks. The data thus cannot be

considered representative of South Africa as a whole, nor used to make countrywide inferences. The selection of study sites also lead to demographic specificity; the respondents to our smokers survey were almost all Black men, and are not representative of either the smoking or overall population of South Africa. An additional consideration is that both researchers and respondents may not have always correctly categorized illicitly traded cigarettes by price and packaging – especially those illicit packages that might have expertly mimicked legal packaging requirements. The survey was also restricted to informal businesses and does not capture data on volumes of sales, or of the sale of illicitly traded cigarettes by formal vendors of tobacco products in South Africa. Moreover, some survey respondents were reluctant to respond to questions specifically dealing with illicitly traded cigarettes and some potential respondents who denied smoking were subsequently seen to be smoking. Finally, use of colloquial terms for illicitly traded cigarettes differed by study site and researchers may not have understood or used the appropriate local colloquial term for illicitly traded cigarettes when administering the survey questionnaire.

Despite these limitations, the three methods we report required little time and resources to conduct. The dummy purchase of cigarettes offered beneficial understanding of local channels of availability, specifically through spaza shops and street vendors. The collection of discarded cigarette packs provided insight into the distribution of illicitly traded brands in the different sample locations. This method, however, is limited by a small sample size and the inability to confirm original place of purchase. Our consumer survey provided anecdotal accounts of smokers' perceptions regarding illicitly traded cigarettes, such as how they were perceived to cause more severe cough. The surveys also provided information on prices paid for "fongkong" cigarettes by city.

Illicit cigarettes were clearly found in all sample sites we selected. Although we cannot report on the overall prevalence of either use or sale of contraband cigarettes, our study formally demonstrates that: there is a significant difference in pricing of illicit and legal cigarettes (average cost difference of ZAR 11.69 [~USD 1.19] between legal versus illicitly traded pack of 20 sold at a street vendor); that

cartons of illicitly traded cigarettes collected are most commonly characterized by the lack of an excise stamp (28.6% overall); and that illicitly traded cigarettes brands are not uniform across the country.

**What this Paper Adds**

It is known that illicitly traded cigarettes have been present in South Africa, but the estimates do not provide insight into the nuances of illicit cigarette trade – details that could be helpful to practitioners and legislators when determining how to address the issue. In this study we piloted three methods for collecting price, brand, and package data on illicitly traded cigarettes. The three methods required little time and resources, and could be undertaken without economics expertise. The data produced by this study can hopefully provide better understanding of the physical characteristics of cigarette boxes; the geographic distribution of brands; on the discrepancy in pricing of illicit and legal cigarette.

**ACKNOWLEDGEMENTS**

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**CONTRIBUTORSHIP STATEMENT**

Authors Anna E. Wherry, Cheyenne A. McCray, and Temidayo I. Adedeji-Fajobi contributed to the design, conception, acquisition, analysis, and interpretation of the project and data; the drafting and revising of the manuscript; and the approval of the final version to be published. Xolani Sibiya contributed to the acquisition of data. Peter Ucko contributed to the design and conception of the project. Limakatso Lebina contributed to the revising of the manuscript and the conception of the project. Dr. Joanna E. Cohen contributed to the drafting and revising of the manuscript and the approval of the final

version to be published. Drs. Jonathan E. Golub, and Neil A. Martionson contributed to the design and conception of the project; the drafting and revising of the manuscript; and the approval of the final version to be published.



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# A Comparative Assessment of the Price, Brands and Pack Characteristics of Illicitly Traded Cigarettes in Five Cities and Towns in South Africa



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University of the Witwatersrand

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# A Comparative Assessment of the Price, Brands and Pack Characteristics of Illicitly Traded Cigarettes in Five Cities and Towns in South Africa

**Anna E. Wherry[1], Cheyenne A. McCray[1], Temidayo I. Adedeji-Fajobi[1], Xolani Sibiya[2], Peter Ucko[3], Limakatso Lebina[2], Jonathan E. Golub[6], Joanna E. Cohen[4,5], Neil A. Martinson[2,5],**

1. Kreiger School of Arts and Sciences, Johns Hopkins University, Baltimore, MD, USA
2. Perinatal HIV Research Unit, University of the Witwatersrand, Johannesburg, South Africa
3. National Council Against Smoking, Johannesburg, South Africa
4. Department of Health, Behavior and Society, Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD, USA
5. Institute for Global Tobacco Control, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA
6. Johns Hopkins University School of Medicine, Center for Tuberculosis Research, Baltimore, MD, USA

**Corresponding Author:**
Dr. Neil Martinson
PO Box 114
Diepkloof 1864
South Africa
Tel: +27119899836
Fax: +27119899762
Email: martinson@phru.co.za

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~~**ABSTRACT**~~

**ABSTRACT**

***Objectives:*** The prevalence of illicitly traded cigarettes in South Africa has been reported to be 40-50%. However, these estimates do not account for the more nuanced characteristics of the illicit cigarette trade. With the goal of better understanding contraband cigarettes in South Africa, this study piloted three methods for assessing the price, brands, pack features, and smoker's views about illicit cigarettes in five cities/towns. Data was collected in June and July 2012.

***Setting:*** A convenience sample of three South African cities (Johannesburg, Durban, and Nelspruit) and two smaller towns (Musina, and Ficksburg) were chosen for this study.

***Outcome measures:*** Three cross-sectional approaches were used to assess the characteristics of contraband cigarettes: (1) a dummy purchase of cigarettes from informal retailers; (2) the collection of discarded cigarette packs; and, (3) a survey of tobacco smokers.

***Participants:*** For the purposes of the survey, 40 self-reported smokers were recruited at taxi ranks in each downtown site. Adults who were over the age of 18 were asked to verbally consent to participate in the study and answer a questionnaire administered by a researcher.

***Results:*** The leading reason for labeling a pack as illicit in each city/town was the absence of an excise stamp (28.6% overall), and the least common reason was an illegal tar or nicotine level (11.1% overall). Overall proportions of informal vendors who sold illicit cigarettes was 41%. Singles and packs of 20 were consistently cheaper at informal vendors. Survey participants' responses reflected varied perspectives on illicit cigarettes and purchasing preferences.

***Conclusion:*** Each approach generated interesting insight into physical aspects of illicit cigarettes. While this pilot study cannot be used to generate generalizable statistics on illicit cigarettes, more systematic surveys of this nature could inform researchers' and practitioners' initiatives to combat illicit and legal cigarette sales and usage.

**STRENGTHS AND LIMITATIONS OF THIS STUDY**

- **Strengths:**
  - The three methods required little time and resources to conduct.
  - The dummy purchase of cigarettes offered beneficial understanding of local channels of availability, specifically through spaza shops and street vendors.
  - The collection of discarded cigarette packs provided insight into the distribution of illicitly traded brands in the different sample locations.
  - The consumer survey provided anecdotal accounts of smokers' perceptions regarding illicitly traded cigarettes, such as how they were perceived to cause more severe cough.
- **Limitations**:
  - As the pilot study is restricted to only small non-randomly selected sites, the data must be understood as illustrative of five specific micro-economies and social networks. The data thus cannot be considered representative of South Africa as a whole, nor used to make countrywide inferences.
  - The selection of study sites lead to demographic specificity; the respondents to our smokers survey were almost all Black men, and are not representative of either the smoking or overall population of South Africa.
  - The survey was restricted to informal businesses and does not capture data on volumes of sales, or of the sale of illicitly traded cigarettes by formal vendors of tobacco products in South Africa.
  - Both researchers and respondents may not have always correctly categorized illicitly traded cigarettes by price and packaging – especially those illicit packages that might have expertly mimicked legal packaging requirements.

~~Some survey respondents were reluctant to respond to questions specifically dealing with illicitly traded cigarettes and some potential respondents who denied smoking were subsequently seen to be smoking.~~

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**BACKGROUND**

The widespread availability of cheaper contraband or illicit cigarettes in South Africa has been touted to undermine national tax efforts to reduce smoking through increasing the price the consumer pays for tobacco products [1-6]. The World Health Organization Framework Convention on Tobacco Control (FCTC) includes provisions to address illicit trade in tobacco products and, in November 2012, the delegates of more than 140 Parties to the FCTC adopted a new international protocol for combating illicit trade [7]. Illicit trade in tobacco products is defined in Article 1 of FCTC as "any practice or conduct prohibited by law and which relates to production, shipment, receipt, possession, distribution, sale or purchase including any practice or conduct intended to facilitate such activity" [8].

There are concerns that recent gains in tobacco control in South Africa may be reduced or even counteracted due to the illicit trade of cigarettes from neighboring countries [9]. News reports describing cigarette "runners" crossing the Zimbabwe border – the 6th largest tobacco exporter globally [10] – suggest they carry an average of ZAR 12,900 [~USD 1,300] worth of illicitly traded cigarettes per run [11-13]. These reports have been utilized by the South African tobacco industry to argue against further increases in excise taxes, [14] using advertising campaigns against the purchase of illicit cigarettes [15]. Tobacco company funded research suggests that 19 million cigarettes are sold illegally every day, ~~and that illicit trade in tobacco products comprises~~amounting to ~~30% of the total market share [16] with~~ an estimated illicit cigarette prevalence of ~~illicit cigarettes in South Africa to be~~ 40-50% in South Africa [16~~7~~].

Currently, there is little known beyond these statistics regarding the characteristics of illicitly traded~~these~~ cigarettes. In this pilot study, we implemented and compared three methods that evaluate

price, types of cigarettes, pack features, and smoker's perceptions of illicit cigarettes in five locations in South Africa.

## METHODS

Criteria for categorizing cigarette packs into "likely illicitly traded cigarettes" and "legal" were based on the 1993 South African Tobacco Products Control Act 83 [178], which stipulates that packs must have a visible South African excise stamp; correct and corresponding health warning labels must be appropriately sized and placed on both the front and back of the pack (there are 8 allowed labeling messages); the South African smoking information telephone number (the National Quit Line: +27117203145) must be printed on the back of the pack; and tar and nicotine content must not exceed 12 mg and 1.2 mg, respectively [178]. Given the excise tax on cigarettes in South Africa, the selling price of single cigarettes and a pack of 20 cigarettes must be at least ZAR 1.5 [~USD 0.15] and ZAR 13.50 [~USD 1.36], respectively [178].

Three approaches were selected and piloted after discussions with local experts in tobacco control, and after investigating the feasibility of implementation. None of the methods in this study required purchase of tobacco products.

### 1. Dummy purchase of cigarettes from informal vendors

Two groups of informal cigarette vendors were included: (1) hawkers or street vendors located close to large taxi ranks, and (2) micro-enterprises or "spaza shops", which are small grocery stores usually located in the yard or house of a private dwelling in large townships or dormitory towns serving the city of each study site. Both spaza shops and street vendors are informal businesses operating with little regulatory oversight and may be more likely to sell illicitly traded goods than a formal supermarket or shop. Street vendors displayed most of what they had for sale in open sight on tables that lined curbsides of streets, allowing customers to browse easily. Spaza shops kept what they had for sale behind glass windows and conducted business through open windows. Their informal quality thus provides an opportunity to observe how contraband cigarettes are traded and sold. The dummy cigarette

purchases were also designed to ascertain the price of legal and potentially illicitly traded brands of cigarettes sold on the streets in the city center (for street vendors) and within residential areas (for spaza shops).

Twenty street vendors and ten spaza shops were surveyed in each city/town. Data were not collected from those vendors nearest to immigration or customs officials to avoid potential legal problems. Two researchers conducted each dummy cigarette purchase; one asked for cigarettes while the other reviewed the different brands available. Based on the brands observed and prices given, if no illicitly traded cigarettes were perceived to be offered for sale, the team would ask the vendor for a cheaper cigarette for less than ZAR 2.00 [~USD 0.24]. Cigarette packaging was observed for legislative requirements to ascertain legality. After examining each brand and determining the cheapest legal and the cheapest illicitly traded cigarette, if available, the researchers would depart and immediately complete a case report form (CRF) which included: presence of cigarettes in packs of 10, packs of 20, or as singles; whether or not illicitly traded cigarettes were observed to be available for purchase; the price of the cheapest legal and cheapest illicitly traded cigarettes, if available, sold in packs of 10, packs of 20, and as singles. Spaza shop visits followed a similar pattern of data collection, except that it was necessary to drive around the local township until a spaza shop was found. Additionally, in spaza shops the team recorded the presence or absence of legally required signs prohibiting the sale of cigarettes to individuals younger than 18 years.

**2. Discarded cigarette packs**

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At least 100 discarded cigarette packs were collected per city/town. The packs collected were found in refuse bins or as litter picked up from sidewalks and gutters, on both sides of the street, within five city blocks of a large taxi rank in each downtown site. The final number of blocks or total length of streets where packs were collected depended on the local street layout and perceived safety of the team. Any visible empty cigarette packs that were not soiled and had legible writing were collected. Gloves were used to pick up the cigarette packs and place them into sealed labeled bags. The collected discarded

cigarette packs were later categorized according to the study definitions (see pg. 2) as illicitly traded or legal.

**3. Smokers survey**

Forty self-reported smokers were recruited at taxi ranks in each downtown site. Adults aged 18 and over were approached and asked if they were smokers. All individuals who reported smoking were asked to verbally consent to participate in the study and answer a questionnaire administered by a researcher. The survey contained basic demographic questions; questions regarding smoking behaviors; as well as questions to ascertain the use of illicitly traded cigarettes, such as brands usually smoked and prices paid for packs of cigarettes and single cigarettes. Participants were also asked if the user ever purchased contraband cigarettes. Finally, participants were asked how they were able to distinguish between legal and contraband cigarettes, and were provided the opportunity to share their personal views on contraband cigarettes. Contraband cigarettes were defined as cigarettes that the participant believed to be illegal or "fongkong," a colloquial term referring to cigarettes traded illicitly. Surveys were conducted in the language of choice of the respondent, and took approximately 10 minutes to complete. Two hundred surveys were completed, 40 in each city/town. After the survey was completed, participants were provided with smoking cessation information if requested.

**Study Sites**

A convenience sample of towns and cities was selected for this pilot study. Three South African cities (Johannesburg, Durban, and Nelspruit) and two smaller towns (Musina, and Ficksburg) were chosen. The locations were selected for their quality as potential "hot spots" for illicit cigarette trade, ensuring the presence of ample cigarette vendors and pedestrian traffic. The localities we selected and their local taxi ranks represent specific micro-economies and therefore cannot be considered representative of the entire city/town let alone South Africa as a whole [8].

Three of the sites (Nelspruit, Ficksburg and Musina) were specifically selected for their proximity to countries neighboring South Africa. Each city's or town's largest minibus taxi rank was

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chosen as the primary hub of the survey due to the universal use of taxi transport by commuters in South Africa. Areas adjacent to taxi ranks in cities and towns in South Africa have a predictably high volume of pedestrian traffic accessing taxi ranks as well as a high density of informal street vendors selling to commuters. *Nelspruit* was selected due to its proximity to both Swaziland and Mozambique. Nelspruit's taxi rank, located on Andrew Street, was used for the study, and spaza shop vendors were selected from the largest residential township in Nelspruit: Kanyamazane. *Musina* was selected due to its proximity to Zimbabwe, the 6th largest tobacco leaf exporter in the world [10]. The taxi rank is located on N1 highway and data collection for the spaza shop vendors was conducted in two of the largest neighboring residential townships in Musina: Freedompark and Niceville. Two townships were used in Musina due to its relatively smaller residential areas in comparison to the other townships in the study. *Ficksburg* is located on the border with Lesotho. The taxi rank on Bloem St is about 200m from and within eyesight of the South African border control post. Data collection for the spaza shop vendors was conducted in the largest residential township in Ficksburg: Meqheleng. *Durban* is the largest seaport serving southern Africa. Cross Street taxi rank was selected for surveys of smokers and of street vendors. The township of Phoenix was selected to identify spaza shops. *Johannesburg* is the economic hub of South Africa. The Noord Street Taxi Rank in downtown Johannesburg was selected to identify smokers and street vendors, and the survey of spaza shop vendors was conducted in Soweto, South Africa's largest residential township. Data collection was conducted in June and July 2012. Each city/town required three to four days to complete study procedures except Ficksburg, which owing to its size and ease of interviews, was completed in just one day.

**Analysis**

Data were stratified by locality and subsequently used to determine the characteristics of illicitly traded cigarettes presented by each methodology. Specifically, the analysis isolated data on: the average prices of contraband cigarettes versus legal cigarettes; the distribution of contraband and legal brands by



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location; the reasons for classifying a discarded cigarette pack as illicitly traded; the proportion of collected discarded cigarette boxes classified as likely contraband; the proportion of sample vendors selling illicitly traded cigarettes; and the proportion of survey participants who reported ever purchasing contraband cigarettes. Epi Info 7 and R statistical tool software were used to analyze the data. Institutional review boards of the Johns Hopkins University and the University of the Witwatersrand approved the survey of self-reported smokers.

**RESULTS**

Data collection was from June 2012 to July 2012. The team did not encounter problems implementing any of the study procedures. In the following section the results are presented according to methodology.

**Dummy purchase of cigarettes from informal vendors**

In Johannesburg, Durban and Nelspruit, vendors appeared to freely provide data on price and sales of illicitly traded cigarettes. However, Musina and Ficksburg were characterized by a reluctance to offer illicit cigarettes. For instance, when asked, many street vendors in Musina said, “go to Zimbabwe.” Overall, the proportion of street vendors who sold illicitly traded cigarettes was 41% with a range from 80% in Nelspruit to 0% in Ficksburg (Table 1). Over half (54%) of spaza shops sold illicitly traded cigarettes with a range of 70% in Nelspruit and Johannesburg to 20% in Musina.

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**Table 1: Proportion of spaza shops and street vendors selling illicitly traded cigarettes**

| | Johannesburg | Durban | Nelspruit | Musina | Ficksburg | Total |
|---|---|---|---|---|---|---|
| Spaza Shop | n=10; 70% | n=10; 60% | n=10; 70% | n=10; 20% | n=10; 50% | n=50; 54% |
| Street Vendor | n=20; 70% | n=20; 30% | n=20; 80% | n=20; 25% | n=20; 0% | n=100; 41% |
| Total | n=30 70% | n=30; 40% | n=30; 77% | n=30; 23% | n=30; 23% | n=150, 45% |

The average retail price of a box of the cheapest 20 "legal" cigarettes was ZAR 30.79 at spaza shops and ZAR 28.00 at street vendors, whereas the average price of the cheapest illicitly traded packs of 20 cigarettes was ZAR 16.31 and ZAR 13.78 at spaza shops and street vendors, respectively (Table 2). Similarly "legal" singles retailed at ZAR 1.99 and ZAR 2.13 at spaza shops and street vendors, respectively, whereas illicitly traded singles typically retailed at ZAR0.95 and 0.93 ZAR (Table 2). Only 16.3% of spaza shops displayed government warnings prohibiting the sale of cigarettes to minors and 10.0% possessed formal advertising stands for cigarettes.

No counterfeit packages of established legal brands were observed, although it is possible that illicit packages for these brands successfully reproduced all legal criteria.

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**Table 2: Average retail price of cheapest legal versus cheapest illicityl traded single cigarettes and packs of 20 at spaza shops and street vendors**

| **Single Cigarettes** | | | | | | |
|---|---|---|---|---|---|---|
| | Johannesburg | Durban | Nelspruit | Musina | Ficksburg | Total |
| Legal | ZAR 1.90 | ZAR 1.97 | ZAR 2.00 | ZAR 2.31 | ZAR 2.26 | ZAR 2.08 |
| Illicitly traded | ZAR 0.85 | ZAR 0.96 | ZAR 1.08 | ZAR 0.6 | ZAR 1.06 | ZAR 0.93 |
| **Packs of 20** | | | | | | |

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|---|---|---|---|---|---|---|
| Legal | ZAR 30.53 | ZAR 27.71 | ZAR 25.05 | ZAR 31.25 | ZAR 29.00 | ZAR 29.34 |
| Illicitly traded | ZAR 15.15 | ZAR 13.8 | ZAR 15.42 | ZAR 11.00 | ZAR 18.83 | ZAR 14.82 |

**Collection of discarded cigarette packs**

Of 558 packs collected from streets, trash piles, bins and gutters, 147 were determined to be illicit (26.3%; 95%CI 22.8, 30.2). The city/town with the highest proportion of discarded illicitly traded cigarettes at the sample sites was Musina (56.3% of all boxes collected) and the site with the lowest proportion was Ficksburg (2.4% of all boxes collected).

The top five brands of discarded cigarette packs categorized as illicit according to study definitions were Remington Gold (43), Safari (29), Dullahs (18), Pacific Blue (16), and Aspen (11) (Table 3). The frequency of illicit brands varied greatly by city/town.

Overall, the leading reasons for classifying a discarded cigarette pack as illicit in descending order were: absence of an excise stamp (28.6%), incorrect or missing health warnings (26.9%), absence of the National Quit Line number (25.9%), tar or nicotine level that was missing or higher than allowed (13.6% and 11.1%, respectively). At least one of these criteria was inadequate or missing in 28.6% of discarded cigarette packs.

**Table 3: Most frequently discarded illicitly traded brands, by city/town**

| | Brand | Number | Proportion among illicitly traded cigarettes | Proportion among all cigarettes collected |
|---|---|---|---|---|
| Johannesburg | Dullahs<br>Remington Gold<br>Grande Turismo<br>Mega 20<br>Kingsgate<br>Pacific Blue | 16<br>9<br>4<br>4<br>2<br>2 | 43%<br>24%<br>11%<br>11%<br>5%<br>5% | 14%<br>8%<br>3%<br>3%<br>2%<br>2% |
| Durban | Pacific Blue<br>Aspen | 13<br>11 | 46%<br>39% | 10%<br>9% |

| | | | | |
|---|---|---|---|---|
| | Mega 20<br>Pall Mall<br>Ransom | 2<br>1<br>1 | 7%<br>4%<br>4% | 1%<br>1%<br>1% |
| Nelspruit | Safari<br>Pall Mall | 29<br>1 | 97%<br>3% | 29%<br>1% |
| Musina | Remington Gold<br>Madison<br>Dullahs<br>Everest<br>Marlboro<br>Mega 20 | 34<br>10<br>2<br>1<br>1<br>1 | 69%<br>20%<br>4%<br>2%<br>2%<br>2% | 39%<br>12%<br>2%<br>1%<br>1%<br>1% |
| Ficksburg | Pacific Blue<br>Pall Mall<br>Sasha | 1<br>1<br>1 | 33%<br>33%<br>33% | 1%<br>1%<br>1% |

**Smokers survey**

Almost all (98.5%) survey participants identified as male and virtually all (97.5%) identified as black South African. The median number of cigarettes smoked was 14 per day. Most respondents (72.1%) reported they usually purchased single cigarettes. 71.1% reported only purchasing legal cigarettes whereas 27.4% reported purchasing both legal and illicitly traded and 1.5% reported exclusively purchasing illicitly traded cigarettes. Participants reported paying an average of ZAR 2.20 for single cigarettes and ZAR 26.6.

The most frequently reported illicitly traded cigarettes purchased by participants were Madison (11reports) and Remington Gold (10 reports). Respondents were asked to describe how they distinguished a “fongkong” or contraband cigarette from a legal cigarette. The three most commonly reported explanations were due to “fongkong” cigarettes having adverse effects on the body, such as causing cough (38); differences in taste (30); and physical differences in the cigarette or packaging (27). Branding was also reported as an indicator of contraband 15 times. Several participants (14) reported not knowing how to distinguish between contraband and legal cigarettes.

**DISCUSSION**

This pilot study utilized three methods to investigate the characteristics of illicitly traded cigarettes in five "hot spot" locations across South Africa. Specifically, information was generated on differences in pricing, types of brands, characteristics of illicit packaging, and perceptions on the use of contraband cigarettes among smokers.

As the pilot study is restricted to only small non-randomly selected sites, the data must be understood as illustrative of five specific micro-economies and social networks. The data thus cannot be considered representative of South Africa as a whole, nor used to make countrywide inferences. The selection of study sites also lead to demographic specificity; the respondents to our smokers survey were almost all Black men, and are not representative of either the smoking or overall population of South Africa. An additional consideration is that both researchers and respondents may not have always correctly categorized illicitly traded cigarettes by price and packaging – especially those illicit packages that might have expertly mimicked legal packaging requirements. The survey was also restricted to informal businesses and does not capture data on volumes of sales, or of the sale of illicitly traded cigarettes by formal vendors of tobacco products in South Africa. Moreover, some survey respondents were reluctant to respond to questions specifically dealing with illicitly traded cigarettes and some potential respondents who denied smoking were subsequently seen to be smoking. Finally, use of colloquial terms for illicitly traded cigarettes differed by study site and researchers may not have understood or used the appropriate local colloquial term for illicitly traded cigarettes when administering the survey questionnaire.

Despite these limitations, the three methods we report required little time and resources to conduct. If future research is successful at using one of these methods to conduct a geographically representative study, governments may also consider conducting such independent studies as a cost-effective and time sensitive alternative to industry estimates. The dummy purchase of cigarettes offered beneficial understanding of local channels of availability, specifically through spaza shops and street vendors. The collection of discarded cigarette packs provided insight into the distribution of illicitly

traded brands in the different sample locations. This method, however, is limited by a small sample size and the inability to confirm original place of purchase. Our consumer survey provided anecdotal accounts of smokers' perceptions regarding illicitly traded cigarettes, such as how they were perceived to cause more severe cough. The surveys also provided information on prices paid for "fongkong" cigarettes by city.

Illicit cigarettes were clearly found in all sample sites we selected. Although we cannot report on the overall prevalence of either use or sale of contraband cigarettes, our study formally demonstrates that: there is a significant difference in pricing of illicit and legal cigarettes (average cost difference of ZAR 11.69 [~USD 1.19] between legal versus illicitly traded pack of 20 sold at a street vendor); that cartons of illicitly traded cigarettes collected are most commonly characterized by the lack of an excise stamp (28.6% overall); and that illicitly traded cigarettes brands are not uniform across the country.

**What this Paper Adds**

It is known that illicitly traded cigarettes have been present in South Africa, but the estimates do not provide insight into the nuances of illicit cigarette trade – details that could be helpful to practitioners and legislators when determining how to address the issue. In this study we piloted three methods for collecting price, brand, and package data on illicitly traded cigarettes. The three methods required little time and resources, and could be undertaken without economics expertise. The data produced by this study can hopefully provide better understanding of the physical characteristics of cigarette boxes; the geographic distribution of brands; on the discrepancy in pricing of illicit and legal cigarette.

**ACKNOWLEDGEMENTS**

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**CONTRIBUTORSHIP STATEMENT**

Authors Anna E. Wherry, Cheyenne A. McCray, and Temidayo I. Adedeji-Fajobi contributed to the design, conception, acquisition, analysis, and interpretation of the project and data; the drafting and revising of the manuscript; and the approval of the final version to be published. Xolani Sibiya contributed to the acquisition of data. Peter Ucko contributed to the design and conception of the project. Limakatso Lebina contributed to the revising of the manuscript and the conception of the project. Dr. Joanna E. Cohen contributed to the drafting and revising of the manuscript and the approval of the final version to be published. Drs. Jonathan E. Golub, and Neil A. Martinson contributed to the design and conception of the project; the drafting and revising of the manuscript; and the approval of the final version to be published.

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**STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies***

| Section/Topic | Item # | Recommendation | Reported on page # |
|---|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract | 2 |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| **Introduction** | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 4 |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | 4 |
| **Methods** | | | |
| Study design | 4 | Present key elements of study design early in the paper | 4-7 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 7-8 |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants | 6-7 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 4-8 |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 8 |
| Bias | 9 | Describe any efforts to address potential sources of bias | 4-8 |
| Study size | 10 | Explain how the study size was arrived at | 5-6 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 8 |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | 8 |
| | | (*b*) Describe any methods used to examine subgroups and interactions | 8 |
| | | (*c*) Explain how missing data were addressed | 13 |
| | | (*d*) If applicable, describe analytical methods taking account of sampling strategy | n/a |
| | | (*e*) Describe any sensitivity analyses | n/a |
| **Results** | | | |

| | | | |
|---|---|---|---|
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 6,11 |
| | | (b) Give reasons for non-participation at each stage | 12 |
| | | (c) Consider use of a flow diagram | n/a |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 12 |
| | | (b) Indicate number of participants with missing data for each variable of interest | n/a |
| Outcome data | 15* | Report numbers of outcome events or summary measures | 9-12 |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | 9-12 |
| | | (*b*) Report category boundaries when continuous variables were categorized | n/a |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | n/a |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | n/a |
| **Discussion** | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 12-13 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 12 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 13 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 12-13 |
| **Other information** | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 14 |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.