



Limited indications of tax stamp discordance and counterfeiting on cigarette packs purchased in tobacco retailers, 97 counties, USA, 2012

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ABSTRACT

Increasing the per-unit cost of tobacco products is one of the strongest interventions for tobacco control. In jurisdictions with higher taxes in the U.S., however, cigarette pack litter studies show a substantial proportion of littered packs lack the appropriate tax stamp. More limited but still present counterfeiting also exists. We sought to examine the role of tobacco retailers as a source for untaxed and counterfeit products. Data collectors purchased Newport Green (menthol) or Marlboro Red cigarette packs in a national probability-based sample of tobacco retailers (in 97 counties) from June–October 2012. They made no effort to buy counterfeit or untaxed cigarettes. In this cross-sectional study, we assessed the presence, tax authority, and type (low-tech thermal vs. encrypted) of cigarette pack tax stamps; concordance of tax stamps with where the pack was purchased; and, for Marlboro cigarettes, publicly available visible indicators of counterfeiting. We purchased 2147 packs of which 2033 had tax stamps. Packs missing stamps were in states that do not require them. We found very limited discordance between store location and tax stamp(s) (< 1%). However, a substantial minority of cigarette packs had damaged tax stamps (13%). This occurred entirely with low-tech tax stamps and was not identified with encrypted tax stamps. We found no clear evidence of counterfeit products. Almost all tax stamps matched the location of purchase. Litter studies may be picking up legal tax avoidance instead of illegal tax evasion or, alternatively, purchase of illicit products requires special request by the purchaser.

1. Introduction

One of the best interventions in tobacco control is raising the per-unit cost of tobacco products (Contreary et al., 2015; Golden et al., 2016). The effectiveness of this policy is undermined, however, by legal and illegal strategies to avoid payment of excise taxes. Following Joossens (Joossens and Raw, 2012), legal tax avoidance would include a consumer buying a product in a low-tax jurisdiction and consuming the product in a higher-tax jurisdiction. Reselling that product, however, would constitute illegal tax evasion. Tax evasion includes (a) the sale of smuggled or bootlegged products (i.e., moving products across jurisdictions to evade taxes), (b) the use of counterfeit tax stamps, or (c) the sale of counterfeit and thus untaxed products. All these forms of tax evasion are part of a broader concept of illicit trade in cigarettes that undermines the effectiveness of per-unit pricing policies. The U.S. Institute of Medicine (IOM) estimated that 8.5% to 21% of the U.S. market in cigarettes avoids or evades taxes (i.e., 1.24–2.91 billion packs of cigarettes per year) (Reuter and Majmundar, 2015). Tax evasion in

the U.S. is thought to operate largely through smuggling cigarettes from states and reservations with low taxes to states and cities with higher taxes (Reuter and Majmundar, 2015).

In high-tax jurisdictions, cigarette pack litter studies find substantial proportions of littered packs with tax stamps from other jurisdictions. For instance, a 2011 standardized litter collection study in major mid-Atlantic and northeastern cities of the U.S. showed 58.7% of packs lacked the local tax stamp, 30.5–42.1% were estimated to be illicit (Davis et al., 2014). Around a New York City college in 2012–2013, 72.4% of littered packs did not have required joint city and state tax stamps (Consroe et al., 2016), and in a 2011 study from the South Bronx of New York City, 76.2% of littered packs did not have the correct tax stamps (Kurti et al., 2013). These findings are similar to 2007 data from Chicago, IL, (75% not matching) (Merriman, 2010) and 2008–2009 data from New York City (45–52% not having NYC stamp) (Chernick and Merriman, 2013).

Nationally, lower but still substantial rates of untaxed cigarettes are found (Barker et al., 2016). In 2009–2010, approximately 20% of

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Fig. 1. Examples of damaged thermal (L) and undamaged encrypted (R) tax stamps.

cigarette packs collected from participants by mail in the International Tobacco Control United States Survey did not have tax stamps matching the residence of the participant (Fix et al., 2014).

These findings from litter and pack mail-in studies likely represent some combination of illegal bootlegging and tax avoidance from individual smokers' legal travel to lower-tax jurisdictions (Hyland et al., 2005). Bootlegging of cigarettes may take two forms: sale by individuals and sale by tobacco retailers. Adult smokers in the Bronx, New York City, report a strong preference for purchasing cigarettes that evade taxes from retailers instead of on the street (von Lampe et al., 2016). Purchase studies, in which packs are bought and inspected, can help identify the specific role of retailers in this type of tax evasion, but fewer of these studies exist. In New York City, 15% of cigarette packs purchased had out of state or counterfeit stamps (Silver et al., 2016a), and the press has termed smuggling an “epidemic” (Campbell, 2015). Whether this problem is limited to extremely high tax jurisdictions like New York City or not, however, is unknown. No national study has examined retailer sales of cigarette packs that evade taxes. Given limited resources available for retailer inspection, a national study is needed to best target those resources and inform development of the U.S. Food & Drug Administration's tobacco retailer inspection protocol as well as state efforts to reduce tax evasion.

This study sought to examine the characteristics of two major brands of cigarettes purchased from standard tobacco retailers with no attempt to obtain untaxed or counterfeit cigarettes in 97 U.S. counties. Specifically, we aimed to (a) examine tax stamps for evidence of tax stamp concordance, (b) assess the durability of thermal versus encrypted of tax stamps, and (c) examine packs for visual indications (Altria Client Service, 2015; Kurti et al., 2017) of counterfeiting.

2. Methods

This research was done as part of the ASPIRE: Advancing Science and Policy in the Retail Environment Study conducted by the University of North Carolina at Chapel Hill, Stanford University, and Washington University in St. Louis as part of the National Cancer Institute's State and Community Tobacco Control Research Initiative. We randomly selected 100 (97 unique) U.S. counties in the contiguous U.S.A. with probability of selection based on the population of county using a Chromy technique with minimal replacement. Approximately, one-quarter of the U.S. population lives in these counties. We created a list of likely tobacco retailers in these counties using 2012 business listings from the North American Industry Classification System (NAICS) Association and ReferenceUSA using methods published previously (Ribisi et al., 2017). The codes for likely tobacco retailers were selected based on the 2007 Census of Retail Trade as they covered 98% of tobacco product sales (Census Bureau, 2010). The types were: tobacco

stores; supermarkets and grocery; convenience stores; gas stations with convenience stores; other gas stations; warehouse clubs and supercenters; news dealers and newsstands; beer, wine and liquor stores; pharmacies; and, discount department stores. After pilot testing (D'Angelo et al., 2014), only Wal-Mart was retained among the discount department stores. For the pharmacies, only the top 50 pharmacy chains were retained as many independent pharmacies do not sell tobacco products (Hickey et al., 2006). State-owned alcohol retailers and known retailer chains (e.g., Whole Foods) that do not sell tobacco products were removed, and vape shops were included if they met study inclusion criteria (i.e., sold tobacco products).

For each selection of a county, we randomly selected up to 55 likely tobacco retailers and verified them by phone with computer-assisted dialing and a phone script. An average of 56% of retailers in each county was confirmed, and in-person data collection was conducted at up to 24 phone-verified stores per selection of a county. In 2147 of the 2346 stores verified by phone, data collectors purchased a single cigarette pack, alternating between Marlboro Red and Newport Green. Data collection took place between June and October 2012. Packs were not purchased in 199 stores due to store closure, clerk refusal, or data collector error. After purchase, data collectors wrote the store ID number on the pack; due to smudging or coding errors, 48 of these could not be linked to stores. Packs were coded following a standardized protocol; reliability was assessed with Krippendorff's alpha (Hayes and Krippendorff, 2007) using 47 packs from 10 randomly selected counties and two independent coders.

2.1. Pack coding: tax stamps

Packs were coded for presence and number of tax stamps (alpha = 1.00), the state of the state tax stamp (alpha = 0.97), jurisdiction of local tax stamps (alpha = 1.00), and use of encrypted or thermal (heat applied) tax stamps, which use an older technology that is less secure (Chriqui et al., 2015) (alpha = 1.00). Our protocol did not assess the reliability for damage to the stamp. Although we assessed some packs for counterfeit product, as described below, we did not assess stamps for counterfeiting. Fig. 1 shows examples of thermal and encrypted tax stamps.

2.2. State and tribal tax stamp concordance

To verify the state and county of pack purchase, as well as whether the purchase was made on an Indian reservation (U.S. Census Bureau. TIGER/Line Shapefile, 2012), we used store latitude and longitude indicators collected by store auditors with the iSurvey app on an iPad 2 tablet (Apple, Cupertino, CA), and linked matched points to counties in QGIS 2.14. We cross-tabulated the state of the store with the

jurisdictions of the tax stamps. We visually inspected tribal reservation concordance. We used a conservative definition of tax stamp discordance by only counting confirmed differences; that is, stamps unidentifiable due to damage are not included in our count of discordant tax stamps.

2.3. Municipality and joint state-local tax stamp concordance

We used QGIS software to plot the location of all municipal tax stamps. We joined this with a 2012 shapefile of Census Bureau places (i.e., boundaries of census-designated cities and towns) (U.S. Census Bureau, 2012). In any locality where a local tax stamp was identified, we examined all geocoded packs from the same census place for presence of a local tax stamp.

2.4. Pack coding: assessment of Marlboro counterfeiting and pack age

We used publicly available indicators of genuine products, specifically lack of fluorescence (assessed with Spectroline [Westbury, NY] UV-4B Specialty Inspection Mini-Lamp, 365 nm wavelength [BLE-220B]) of cigarette pack’s foil interior (Altria Client Service, 2015; Kurti et al., 2017) (Krippendorff’s alpha = 1.00), if the crest of Marlboro packs said “PM USA” (alpha = 0.96) (Altria Client Service, 2015), if the manufacturer address spelling was correct (alpha = 1.00) (Altria Client Service, 2015), the elasticity of tear tape (alpha = 0.96) (Philip Morris USA, 2000), and if the Marlboro tear tape said “Marlboro - Selected Fine Tobaccos -” (alpha = 1.00) (Altria Client Service, 2015). We could not assess counterfeiting for Newport packs. We used publically available information (Altria Client Service, 2015) from Altria to convert Marlboro pack codes to date of manufacture and calculated the age of each pack.

We used SPSS 24 (IBM, Chicago, IL) for analyses. The University of North Carolina at Chapel Hill’s IRB deemed this project not human subjects research (#12-0765).

3. Results

Of the 2147 packs purchased, 2033 had a tax stamp. Of these, 70 stamps could not be identified (e.g., only adhesive remained, covered by other stickers). All 114 with no tax stamp were purchased in jurisdictions with no tax stamp requirements (e.g., North Carolina). Of the remaining packs, 1930 had a state tax stamp; 96 had a local, joint local (e.g., city and county), or joint-state local stamp; and, 5 had a U.S. tribe tax stamp. One pack had the wrong state tax stamp for that jurisdiction. Two packs were identified missing a local or joint-local tax stamp (Table 1).

Of the packs purchased, 310 had high-tech, encrypted tax stamps and the remaining used older thermal technology (Table 2). No damage

Table 1
Tax stamp discordance, n = 2033 packs, 97 U.S. counties, 2012.

Tax stamp indicator	Count (%)
State of purchase and tax stamp do not match	1 (0.05%) ^a
County of purchase and tax stamp do not match	0 (0%)
Municipality of purchase and tax stamp do not match	2 (0.10%) ^b
Tribal tax stamp on non-tribal land	2 (0.10%) ^c
No tribal tax stamp on tribal land	1 (0.05%) ^d
Foreign tax stamp present	0 (0%)

^a A pack purchased in Maryland, just across the border from Pennsylvania, with a Pennsylvania tax stamp.

^b Packs purchased inside the city limits of Chicago, IL, and Ashland, VA, did not have a joint city-county or municipal tax stamp, respectively.

^c A pack outside of the Colville Reservation boundary in Washington State and a pack in the Cherokee Oklahoma Tribal Statistical Area (OTSA) in a county where no other stores had a tribal tax stamp but were all within the OTSA.

^d A pack purchased inside the Colville Reservation boundary in Washington State.

Table 2
Tax stamp durability, n = 2033 packs, 97 U.S. counties, 2012.

	“Onion skin” decal (n = 1723)	Encrypted stamp (n = 310)
Partial, obscured, missing or otherwise damaged stamp(s)	264 (15%)	0 (0%)
Stamp unidentifiable because marked out or covered	3 (0.17%)	0 (0%)
Stamp unidentifiable because covered by another stamp	7 (0.41%)	0 (0%)
Stamp fallen off completely	1 (0.06%)	0 (0%)
One-third or more missing	103 (6%)	0 (0%)
ID number incomplete	202 (12%)	0 (0%)
Incomplete origin	137 (8%)	0 (0%)
Unidentifiable stamp due to damage	70 (4%)	0 (0%)

Table 3
Indicators of genuine, non-counterfeit Marlboro packs and age of Marlboro cigarette packs, 97 U.S. counties, 2012.

	Count (%)
Indicators of genuine product (n = 1090)	
No florescence of cigarette pack inner foil	1090 (100%)
PM USA crest	1090 (100%)
Address correct	1080 (99%) ^a
Tear tape does not break easily	1090 (100%)
Tear tape text	1090 (100%)
Age (n = 1024) ^b	
< 1 month	3 (0.3%)
1–3 months	717 (70%)
> 3–6 months	257 (25%)
> 6 months	46 (4%)

Note: Age percentages do not add to 100 due to rounding.

^a 10 packs did not have “manufactured by” preceding “Philip Morris USA Richmond, VA 23261”. These came from three separate states and were all manufactured in late September and October 2012.

^b Age could not be calculated for 66 packs due to smudging or damage to the date code.

was detected among the encrypted tax stamps, whereas 15% of thermal stamps were damaged (Fig. 1).

Of the 2147 packs purchased, 1090 were Marlboro and were examined for visual indicators of pack counterfeiting. There were few visual indications of product counterfeiting (Table 3). Ninety-nine percent of Marlboro packs showed no visual indications of counterfeiting. Ten packs manufactured in September and October 2012 omitted the “manufactured by” preceding “Philip Morris USA Richmond, VA 23261.” We identified no reason for this difference (e.g., none of our stores were duty free). The average Marlboro pack purchased was 87 (sd = 57.7) days old and pack age ranged from 24 days to 656 days.

4. Discussion

When no attempt is made to purchase untaxed or counterfeit cigarettes, the vast majority of standard tobacco retailers appear to be selling properly taxed cigarette packs that do not show indications of product counterfeiting. Our national results contrast sharply with cigarette pack litter studies from high tax jurisdictions (Davis et al., 2014; Consroe et al., 2016; Merriman, 2010; Chernick and Merriman, 2013); a national cigarette pack litter study, which found 18.5% of packs indicated tax avoidance or tax evasion (Barker et al., 2016); and, from a national pack mail-in study (Fix et al., 2014), which found that state tax stamps did not match with the participants’ state of residence for 20% of 686 packs mailed in by participants in the International Tobacco Control United States Survey. Our results suggest each of these may be picking up legal consumer tax avoidance behavior as well as smuggling, as well as possible purchase from illicit sources (e.g., individual sales)

(Fix et al., 2014). Our study was not able to assess counterfeiting of tax stamps, which were found in two-thirds of illicit cigarettes purchased in a New York City study (Silver et al., 2016a).

On the other hand, our findings are consistent with the National Academy of Medicine (NAM) report on illicit trade, which found only limited amounts of product counterfeiting in the U.S. (Reuter and Majmundar, 2015). The NAM report also suggests that much of the existing literature, such as pack litter studies, “cannot distinguish among tax avoidance, tax evasion, tourism, and commuting patterns” (Reuter and Majmundar, 2015, p.25) and has important limitations. These include only sampling heavy smokers (e.g., Fix et al., 2014), which may overestimate illicit cigarettes given the greater importance of price for heavy smokers (Reuter and Majmundar, 2015). While our study finds low levels of tax evasion through the retail sales channel using a purchase protocol that did not seek to buy illicit products, it fits within the general findings of the NAM report. The NAM report estimated 8.5% of the cigarette market is constituted of tax evasion or legal tax avoidance (Reuter and Majmundar, 2015).

The NAM report and other studies, however, suggest substantial regional variation, with higher rates of illicit cigarettes in high-tax jurisdictions (Reuter and Majmundar, 2015; Barker et al., 2016; Fix et al., 2014), a pattern that we did not observe. Our study does not assess non-retail purchases (e.g., Internet, street corner) of untaxed or counterfeit cigarettes, nor does it assess purposeful attempts to buy untaxed or counterfeit cigarettes at retailers. Smokers commonly report legal and illegal ways to minimize prices, including use of Internet, Indian reservations, cross-border purchasing, and code words with retailers (Hyland et al., 2005; von Lampe et al., 2016).

Our results show substantially lower levels of smuggled cigarette packs nationally than identified in purchase studies at New York City retailers where 15% of cigarette packs had incorrect or counterfeit tax stamps (Silver et al., 2016a). This New York City study, which was part of an effort to test age-of-sales requirements used casually-dressed, racially/ethnically diverse young women (age 18–21) who requested Marlboro Gold cigarettes with no attempt to purchase an illicit pack (Silver et al., 2016b). Our data collectors traveled from other parts of the country, were not selected for their age, and were not instructed to dress casually, which may have influenced this difference.

A substantial minority of packs had tax stamps that were damaged. Thermal style stamps using 1950s technology appear to have limited durability and are prone to damage (Ribisl, 2012). This is particularly concerning since most of the Marlboro cigarettes in our study had been manufactured only a couple of months earlier, suggesting that thermal stamps were deteriorating rapidly. States should consider tax stamps that are more durable and allow for tracking of products as well as verification of tax payment. Technologically sophisticated tax stamps may also minimize tax stamp counterfeiting and serve an important role in a comprehensive effort to reduce illicit trade in cigarettes (Chriqui et al., 2015). In addition, since our age analyses suggest that only 4% of packs remained on store shelves for longer than six months, regulations that require changes to cigarette packs (e.g., new stamps or other policies like bans on flavor or descriptors) could reasonably be fully implemented in less than one year as existing retailer inventory is exhausted or required to be removed by the manufacturer. However, we only examined the age of cigarettes in one premium brand, Marlboro.

This research has important implications for inspection protocols to identify smuggled, untaxed, or counterfeit cigarettes. Our study, which made no special attempt to buy cheaper cigarettes, found little evidence of retailer sales of illicit products. However, if such products are being sold by retailers – as indicated in some compliance check studies (Silver et al., 2016a) and suggested by pack litter studies – inspection protocols should draw on lessons learned from experimental work in youth access protocols. For example, inspection protocols should consider developing rapport through multiple visits (Landrine and Klonoff, 2003), using repeat inspections to improve reliability (Levinson and Patnaik, 2013), and engaging in authentic consumer behaviors (Lee et al., 2016).

Focus groups with adult smokers in the Bronx find that buying illicit cigarettes requires the store clerk be familiar with the customer or to know the code words for illicit cigarettes (von Lampe et al., 2016). Given findings from litter studies, inspections programs should also consider targeted inspections in areas where illicit products are being sold.

One strength of our study is its national reach. Of the 97 counties included in the study, 40 were located in counties with above average state tax (i.e., > \$1.71, 35 were in counties with excise taxes over \$2, and 12 were in counties with excise taxes over \$3 (Campaign for Tobacco-Free Kids, 2017).

4.1. Limitations

This research has important limitations. First, we did not have access to tobacco company or law enforcement inspection of pack counterfeiting. Although we based our analysis on publicly available indicators of authenticity, our results might have been different with more advanced laboratory methods to detect counterfeiting. Second, this study may not generalize outside of the 97 unique counties. Our sampling strategy, which was designed for a point-of-sale marketing audit, included phone verification of retailers; this may have skewed the included retailers toward larger and chain stores more likely to have and answer a listed phone number. Larger and chain retailers may be more likely to be compliant with regulations. Although we did not collect data on corporate ownership, 70% of retailers included in this study had 2 or fewer registers and 84% had 5 or fewer registers, so it is unlikely that high numbers of large stores are responsible for our findings of little tax stamp discordance. Third, while we had few packs purchased from tribally-controlled land or with tribal tax stamps, assessing which retailers are subject to tribal taxes is challenging (DeLong et al., 2016; Laux et al., 2015). Our assessment of tribal tax stamp concordance may be subject to some degree of error. Fourth, we were not able to assess tax stamps for counterfeiting; this is an important limitation given that researchers in New York City found about two-thirds of illicit packs purchased in retailers had counterfeit tax stamps (Silver et al., 2016a). Fifth, we did not collect information on the demographic characteristics of the data collectors; retailers may be more or less likely to sell to individuals from certain demographic groups.

5. Conclusion

Tax avoidance and illicit trade cause states and municipalities to lose revenue and also undermine one of the most effective tobacco control interventions, higher per-unit costs of tobacco products (Contreary et al., 2015; Golden et al., 2016; Reuter and Majmundar, 2015). We found limited evidence of tax evasion at standard tobacco retailers when no specific attempt was made to purchase cheaper cigarettes. Nor did we find clear evidence of pack counterfeiting. More covert approaches to identifying bootlegged cigarettes in inspections programs and approaches that address counterfeit tax stamps, as well as policies that reduce opportunities for legal price minimizing strategies, may be necessary. Inspections programs should consider tailoring their protocols to local conditions that have been identified in smaller studies. Litter studies may be picking up legal tax avoidance instead of illegal tax evasion or, alternatively, purchase of illicit products requires special request by the purchaser or is done outside of the retail channel.

Conflicts of interest and source of funding

Joseph G. L. Lee and Kurt M. Ribisl receive licensing royalties from a store audit/compliance and mapping system owned by the University of North Carolina at Chapel Hill. The audit tool and mapping system were not used in this study. Kurt M. Ribisl has served as an expert consultant in litigation against cigarette manufacturers and Internet tobacco vendors. Research reported in this publication was supported by the

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