Smuggled tobacco, deprivation and addiction

Andrew J. Taylor¹,², Mark Langdon¹, Peter Campion¹

Objective: To identify the links between smuggled tobacco, deprivation and addiction across one Health Authority in the North East of England and identify the impact on people living in disadvantaged areas.

Design: Anonymous postal survey. Sample size 11,443. Multivariate analysis including an 'Ideal Types analysis' examined the probabilities of purchase of smuggled tobacco and associations with population characteristics. Setting: Sample taken from across the Hull & East Riding Health Authority area in the UK.

Participants: Randomly selected from those aged 16 and over, who were registered with a GP in the Health Authority area on the 1 September 2000. Results: The predicted probability of having ever bought smuggled tobacco for a male, employed, heavy smoker living in a deprived area was 0.67. A female with the same characteristics had a probability of 0.49. For the unemployed the probabilities are 0.55 and 0.37 respectively. For respondents living in non-deprived areas the probability of having ever bought smuggled tobacco was much lower. This probability was further reduced for respondents who were unemployed. Respondents living in deprived areas had a 134% higher probability of being heavily addicted to tobacco. Links between addiction and deprivation are confirmed. Conclusions: This study confirms and extends the findings of previous qualitative studies. The results of this analysis demonstrate that people who have bought smuggled tobacco are heavy smokers with high levels of addiction, living in socially deprived areas, but are more likely to be in employment. They are likely to use smuggled tobacco to save money and sustain their smoking habit.

Keywords: tobacco, smuggling, deprivation, smoking, addiction
independently of individual poverty and socio-economic status. Poor resources, a stressful environment, strong community norms, isolation and limited opportunities for respite and recreation are found to foster smoking and discourage cessation. The study suggests that usually beneficial elements such as support networks and identity seem to encourage smoking in these areas, working against smoking cessation and other public health schemes.

Another recent study of smuggled tobacco based in two areas of socio-economic deprivation in Edinburgh, UK, finds that the ‘smuggling network is viewed positively by low income smokers as a way of dealing with the increasing cost of cigarettes. A 2003 paper examines the determinants of purchasing smuggled cigarettes in Taiwan, concluding that cigarette price is the driving factor in the decision to buy. The importance of government action is identified by Shimkhada and Peabody who suggest that ‘Government must also introduce policies to raise taxes, control smuggling, close advertising loopholes, and create adequate provisions for the enforcement of tobacco control laws’.

The research presented here builds on this evidence, clarifying issues identified in the literature.

**Methods**

**Questionnaire**

The questionnaire was based on previously validated questionnaires. It was important to pilot the questionnaire due to the inclusion of sensitive questions about smuggled tobacco. A number of qualitative interviews were conducted with smokers to determine their willingness to answer questions about smuggled tobacco. The questionnaire was cognitively tested before a final pilot with 100 randomly selected people.

**Sample**

This questionnaire was sent to a random sample of adults, aged 16 and over (the legal age for smoking in the UK), registered with a doctor in the East Riding and Hull area on the 1 September 2000. This sample represents 280,000 people who live in close proximity to major ports where smuggling and contraband from Europe is possible.

The research team used details of 46 electoral wards and their scores on the Multiple Deprivation Index (MDI), obtaining a 4% random sample from each of the 23 electoral wards with a MDI score of 25 or more. For all other electoral wards a sample of 1% was obtained. A six-week reminder was sent to all individuals.

Questionnaires were sent to 11,443 individuals, of which people living in deprived wards constituted 9204 (80%) of the overall sample, over-sampling being dealt with by using logistic regression.

**Model**

If we consider the choice decision in a simple economic model where income is constrained but price may vary when smuggled tobacco becomes available. Consider a smoker with spare income of £70 a week after essential costs, who smokes 140 cigarettes a week at a cost of £32 spending the remainder of income (£38) on alcohol. An opportunity to buy smuggled tobacco may arise. If smuggled tobacco becomes available the cost of smoking the original amount of cigarettes could drop to £16 a week (the equivalent of a price cut), leaving an additional £16 to spend between, perhaps, alcohol and cigarettes. The smoker may choose to smoke more and drink more. For example, they may increase smoking by 10 cigarettes a day, to a total spend at the smuggled price of £24 (30 a day) and still increase purchase of alcohol by £8 a week to a total of £46. It would be expected that, if there is a supply of cheap tobacco, people might spend less and smoke more.

As identified earlier, when prices fall, people increase their smoking quickly, but when prices rise there is a lag before consumption falls. It would be expected that a similar scenario would ensue with smuggled tobacco, where consumption would increase when smuggled tobacco is available. When smuggled tobacco is no longer available smoking might be slow to fall to the original level, due to this addictive quality.

**Variables**

The variables and their expected outcomes were as follows:

- **Boughtsmuggled**: the dependent variable. Scores 1 if the person answers positively the question ‘have you every bought cheap tobacco from Europe which you have not collected in person’ and 0 otherwise. This wording allows the answer to be made without the respondent admitting that they were in contact with an illegal act.
- **Gender**: male or female. It was not clear whether there would be any difference in the rate for buying smuggled tobacco between males and females, although higher prevalence of smoking and, perhaps, greater use of premises where alcohol is consumed, might offer a combination of greater incentive and extended opportunities to buy smuggled tobacco.
- **Weekly spending on tobacco in UK £**: a continuous variable. The expectation being that people buying smuggled tobacco were likely to save money on their smoking, perhaps smoking more as a result of prices being lower.
- **Deprivation**: based on the Department of the Environment, Transport and the Regions Indices of Deprivation, a binary variable where wards which have a score ≥ 25 on the index of multiple deprivation = 1. It was expected that people living in deprived areas would be more likely to buy smuggled tobacco.
- **Heavy smoker**: a binary variable. Scores 1 when defined as smoking more than 20 a day, the expectation being that heavy smokers would be more likely to buy smuggled tobacco, possibly ‘feeding their habit’ by this means.
- **Employment**: It was unclear before the regressions were undertaken as to what effect employment would have on buying smuggled tobacco. We wished, however, to test the hypothesis identified by Wiltshire et al. who found that wider social networks provided through employment, increase the probability of having bought smuggled tobacco.
- **Low qualifications**: a binary variable. Scores 1 if a person has less than A-Level qualifications (year 13, age 18 at UK schools) and 0 otherwise.
- **Age**: a continuous variable giving the age of the respondents. The variable was included to use as a sorting variable for ideal type analysis.

**Addiction**

Within the questionnaire a number of questions were included which could be used to determine the degree to which the respondent was addicted to nicotine. These questions were ‘How often do you smoke’, ‘Do you smoke regularly throughout the day’ and ‘Do you smoke your first cigarette within 20 minutes of waking up?’ From these three questions an algorithm was formed which would produce one single score. The algorithm coded respondents as addicted if they answered:

- yes for the question asking about smoking within 20 minutes of waking.
- yes for the question asking if they smoke regularly during the day and ‘everyday’ when asked how often do you smoke?
Table 1 Smoking status within first and reminder questionnaires returned

<table>
<thead>
<tr>
<th>Smoking status</th>
<th>Questionnaires returned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st circulation (%)</td>
</tr>
<tr>
<td>Smoker</td>
<td>18%</td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>32%</td>
</tr>
<tr>
<td>Non-smoker</td>
<td>50%</td>
</tr>
</tbody>
</table>

Methodological issues

In total 4624 questionnaires were completed. At the start of the questionnaire the respondents were asked to identify their smoking status by ticking one of three boxes: ‘smoker’, ‘ex-smoker’ or ‘non-smoker’. The percentage of smokers, ex-smokers and non-smokers across combined ward groups is shown in Table 1. The response rate of 40% (37% from deprived wards, 43% from less deprived) may be due to perceptions about smuggled tobacco. It is possible that there is negative stigma attached to smoking and buying smuggled tobacco may be perceived as a semi-legal activity.

Additionally, it is generally accepted that response rates would be low from deprived areas. Reasons for this include alienation towards research, suspicion around access to medical records, incorrect addresses, home demolished/unoccupied, high mobility/transience.

An analysis of bias compared smoking status of respondent replying to the initial questionnaire and those responding to the reminder questionnaire. As can be seen in Table 1, there is a difference between the percentage rates of smokers and ex-smokers responding to the first and those responding to the reminder questionnaire (Chi-square test, \( P > 0.001 \)).

Parry et al. address issues of non-response bias in disadvantaged areas with a specific focus on smoking. Their paper suggests that ‘One of the purposes of research that targets disadvantaged communities is to give a voice to those who are marginalized or socially excluded.’ It is for this reason that we have undertaken this analysis, bearing in mind that there may be a small element of bias in the results.

Logistic regression and selective sampling/weighted logistic analysis

There are no difficulties in respect of the over-sampling in areas with differing socio-economic characteristics when using logistic regression. Maddala describes how logistic regression when there is non-proportionate sampling is, in effect, a form of discriminant analysis, and that ‘logit coefficients are all correct’, i.e. the slope coefficients are unaltered by the sampling method.

Data analysis

We carried out logistic regression using the Stata software program to compare those who reported that they have ever bought smuggled tobacco with those who have not in order to examine the interactions between smuggled tobacco and variables of interest. Tests for specification error, multicollinearity, and goodness of fit were all satisfactory.

Results

Within the sample those who report having used smuggled tobacco for all smokers was 44.2%; 41% were cigarette smokers and 52% used loose tobacco (hand-rolled). Although this may seem high, it should be considered that people within this group might have only bought smuggled tobacco on few occasions because the questionnaire asked ‘have you ever bought’.

Odds ratios are shown in Table 2. These indicate that men are more likely to have bought smuggled tobacco than women.

Those who have bought smuggled tobacco spend slightly less on tobacco than those who have not. Those living in deprived areas are more likely to have bought, as are heavy smokers and people who have jobs. All variables with the exception of age (a sorting variable) are statistically significant at the 5% level.

Probability of having bought smuggled tobacco and expenditure on smoking

An illustration of how the amount spent on smoking interacts with the probability of having bought smuggled tobacco (all other variables held constant) is shown in Figure 1. There is a linear relationship between smoking spending and having ever bought.

Ideal types analysis

An ideal types analysis was conducted to examine probabilities of having bought smuggled tobacco for certain types of people. Probabilities are expressed on a scale where 0 represents a zero probability and 1 represents absolute certainty.

Within our sample the predicted probability of having bought smuggled tobacco for a male, employed, heavy smoker living in a deprived area is 0.67. A female with the same characteristics has a 0.49 probability. If the subjects of our analysis were unemployed the male probability would be 0.55 and the female probability would be 0.37.

An employed male in a deprived area, not a heavy smoker has a 0.53 probability of having bought smuggled tobacco, whereas a woman in similar circumstances would have a 0.35 probability. For the unemployed the corresponding probabilities are 0.4 for men and 0.25 for women.

In the case of a male living in a non-deprived area, employed and a heavy smoker the probability is 0.53 and for a similar female 0.35. For the unemployed, in a non-deprived area the probabilities are 0.41 for men and 0.24 for women. A light smoking employed male in a non-deprived area has a 0.38 probability of having bought smuggled tobacco, compared with

Table 2 Odds ratios from logistic regression ‘has bought smuggled tobacco’

<table>
<thead>
<tr>
<th>Dependent variable Bought smuggled</th>
<th>Odds ratio</th>
<th>SE</th>
<th>z</th>
<th>P &gt; z</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (male)</td>
<td>2.10</td>
<td>0.408</td>
<td>3.80</td>
<td>0.000</td>
<td>1.421–3.07</td>
</tr>
<tr>
<td>Weekly spend</td>
<td>0.975</td>
<td>0.010</td>
<td>2.28</td>
<td>0.023</td>
<td>0.954–996</td>
</tr>
<tr>
<td>Living in deprived area</td>
<td>1.80</td>
<td>0.462</td>
<td>2.27</td>
<td>0.023</td>
<td>1.08–2.97</td>
</tr>
<tr>
<td>Heavy smoker</td>
<td>1.81</td>
<td>0.447</td>
<td>2.39</td>
<td>0.017</td>
<td>1.11–2.93</td>
</tr>
<tr>
<td>Employed</td>
<td>1.66</td>
<td>0.326</td>
<td>2.58</td>
<td>0.010</td>
<td>1.12–2.44</td>
</tr>
<tr>
<td>Age</td>
<td>0.90</td>
<td>0.058</td>
<td>−1.7</td>
<td>0.089</td>
<td>0.787–1.01</td>
</tr>
</tbody>
</table>
Evidence base. The analysis, focused on a specific area in North
This paper presents new findings to add to a currently sparse
Deprivation, addiction and smuggling

The results of which are shown in tables 4 and 5. Calculated

Discussion and Conclusion

This paper presents new findings to add to a currently sparse
evidence base. The analysis, focused on a specific area in North

Deprivation, addiction and smuggling

The question arises as to whether those who live in deprived

Addiction and smuggled tobacco

We wished to discern whether or not the subset of participants

Table 4 Logistic regression results (550 observations):

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>Z Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has bought smuggled tobacco</td>
<td>0.581</td>
<td>(2.46)*</td>
</tr>
<tr>
<td>Deprive &gt; 25</td>
<td>0.687</td>
<td>(2.72)**</td>
</tr>
<tr>
<td>Low qualifications</td>
<td>0.880</td>
<td>(3.29)**</td>
</tr>
<tr>
<td>Constant</td>
<td>0.449</td>
<td>(1.96)*</td>
</tr>
</tbody>
</table>

*Significant at 5%; **Significant at 1%.

Table 5 Predicted probabilities of percentage change in odds
of having bought compared with not having bought
smuggled tobacco

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percentage Change In Odds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bought smuggled tobacco</td>
<td>78.9</td>
</tr>
<tr>
<td>Deprive &gt; 25</td>
<td>98.8</td>
</tr>
<tr>
<td>Low qualifications</td>
<td>141.1</td>
</tr>
</tbody>
</table>

Smuggled tobacco, deprivation and addition

East England) indicates that having bought smuggled tobacco is
associated with increased smoking levels and addiction, particularly in people who live in deprived areas. The link
between price and consumption is clear and is consistent with
the substantial body of research evidence on legitimate tobacco.

The results give an insight into other determinants. The availability of bootleg tobacco through social networks is important, as our results on employment suggest. This result
supports the study14 that found that social networks were likely
to increase smoking, explaining an important mechanism in
tobacco addiction. The workplace may thus be a fruitful place
for initiatives to limit smoking.

The results of this analysis identify the people with the highest likelihood of having bought smuggled tobacco. These are:
heavier smokers with higher levels of addiction, living in socially
deprived areas and with low educational attainment. It should
be noted that other causal factors will be in play, for example
living in disadvantaged areas is likely to bring about an increase
in stress that may encourage addiction.

In order to help this group to stop smoking it may be
necessary to limit the supply of cheap tobacco by means of more
effective sanctions on smugglers to the UK.

In the case of bootlegged tobacco, Government should consider implications of any future EU tax harmonisation,
which would result in a lower UK price differential because this
would lead to higher consumption of tobacco in the UK. In the
case of contraband tobacco it is necessary to tackle the ‘one third
of global exports finding their way to the contraband market’15
by better border controls, pack marking and tracking systems,
together with higher penalties on criminals and sanctions on
manufacturers.

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Competing interests

None.

Key points

- The paper explores how smuggled tobacco impacts on the smoking habits of deprived people in the North East of the UK, comparing with those who are not deprived.
- The results show that those who live in deprived areas are more likely to have purchased smuggled tobacco and suggest that its availability increases tobacco addiction.
- Increased social networks encountered when people are at work are found to increase the likelihood of having bought smuggled tobacco.
- Smoking cessation initiatives might focus on areas where it is identified that there is greater availability of smuggled tobacco in order to counteract this tendency.
- Public health practitioners might co-operate with lobby police and customs and excise forces in order to encourage them to control smuggled tobacco.

References

8. Emery S, White MM, Gilpin EA, Pierce JP. Was there significant tax evasion after the 1999 50 cent per pack cigarette tax increase in California? Tob Control 2002;11:130.

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What is known in this area

Tobacco is implicated as a major cause of health inequality especially amongst those who suffer the greatest health deprivation.

Qualitative studies, examining the UK situation, indicate that smuggled tobacco is widely available in deprived and other areas and that social networks facilitate the purchase of smuggled tobacco.

What this paper adds

Heavier smokers with higher addiction levels, living in deprived areas with low educational attainment are most likely to have bought smuggled tobacco.

People who are employed are more likely to have bought smuggled tobacco, possibly due to improved social networks.

People who have ever bought smuggled tobacco are likely to exhibit higher consumption and higher addiction.

Tax harmonisation, if it reduced UK tobacco prices to match the current lower European ones, may reduce tobacco bootlegging by reducing incentives, but would increase smoking.