Published in final edited form as:

Tob Control. 2017 November ; 26(6): 703–708. doi:10.1136/tobaccocontrol-2016-053339.

Neighbourhood exposure to point-of-sale price promotions for cigarettes is associated with financial stress among smokers: results from a population-based study

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Abstract

Aim—To examine the association between neighbourhood exposure to point-of-sale (POS) cigarette price promotions and financial stress among smokers in a Midwestern metropolitan area in the USA.

Methods—Survey data from 888 smokers provided information on sociodemographic and smoking related variables. Financial stress was measured with the question: ‘In the last six months, because of lack of money, was there a time when you were unable to buy food or pay any important bills on time, such as electricity, telephone, credit card, rent or your mortgage? [Yes/No].’ Using audit data from 504 tobacco retailers, we estimated a score of POS price promotions for each respondent by summing the different types of promotion in each store in their neighbourhood, as defined by a 1-km roadway buffer.

Results—Adjusted results provided strong support for an association between higher scores of neighbourhood POS cigarette price promotions and a higher probability of financial stress ($p=0.007$).

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Contributors: All authors included in this manuscript fulfil the criteria of authorship. All have made substantial contributions to: conception or design; or the acquisition, analysis or interpretation of the data. They all have contributed drafting of the work or revising it critically for intellectual content. They all approve the final version to be published. In addition, there is no one else who fulfils the criteria but has not been included as an author.

Competing interests: None declared.

Ethics approval: University of Nebraska Medical Centers’ Institutional Review Board.

Provenance and peer review: Not commissioned; externally peer reviewed.

Conclusion—Exposure to POS cigarette price promotions is associated with financial stress. This finding, coupled with previous reports that smokers with financial stress are less likely to attempt to quit or succeed in quitting smoking, suggests that POS cigarette price promotions may act as an impediment to smoking cessation.

INTRODUCTION

Tobacco is one of the most marketed products in the USA.¹ In the wake of the 1998 Master Settlement Agreement, which imposed significant prohibitions on cigarette marketing such as banning outdoor advertising, the tobacco industry has increasingly concentrated its marketing efforts at the point of sale (POS).^{2–4} Tobacco POS marketing consists of cigarette pack displays, posting advertising and signage, and promotional and price incentives for consumers.^{3,5} The tobacco industry allocates by far more resources to sales promotion activities than to the other components of marketing. In 2013, over 85% of the \$8.9 billion of tobacco industry expenditure on marketing was made on POS sales promotion activities to reduce the price of cigarettes.⁶

Research in Australia and USA has documented the association of cigarette marketing with impulse purchase of cigarettes and smoking cessation. In a cross-sectional study of 526 smokers in Australia, Wakefield *et al* reported that compared with smokers who rarely or never noticed cigarette pack displays, the probability of an impulse purchase of cigarettes, that is, deciding to buy cigarettes when shopping for something other than cigarettes, was higher among those who at least sometimes noticed displays.⁷ Similar results were reported by Siahpush *et al* in their study of a sample of 944 smokers in the USA. They measured POS marketing using a summated scale from three survey questions about frequency of noticing cigarette pack displays, advertisements and price promotions. Their results showed that higher exposure to marketing was associated with a higher frequency of impulse purchases of cigarettes.⁸ Using the same scale of cigarette marketing, Siahpush *et al* examined the prospective association of exposure to POS marketing at baseline with smoking cessation reported at 6-month follow-up in a sample of 257 smokers in the USA.⁹ They found that higher levels of exposure to POS marketing was associated with a lower probability of smoking cessation. Similarly, in a prospective study of 222 smokers in Australia, Germain *et al* examined the association of ‘sensitivity’ to POS tobacco displays reported at baseline with quitting behaviour reported at 18-month follow-up.¹⁰ They measured sensitivity to POS tobacco displays with an index consisting of the following three variables: the frequency of noticing tobacco displays, unplanned purchasing behaviour and deciding on brands based on POS displays. The study revealed that lower sensitivity to POS marketing was associated with a higher probability of smoking cessation.

A consequence of continued smoking, failing to quit smoking and spending money on cigarettes, is diminished financial and material well-being.^{8,11–17} Siahpush *et al* used four waves of prospective data from 5699 ever-smokers in Australia to examine the subject-specific association of smoking cessation with financial stress and material well-being.¹¹ They measured financial stress with a binary variable indicating whether in the past 6 months the respondent had experienced such events as going without meals, not being able to pay rent or not being able to pay important bills on time due to lack of money. Material

well-being was measured by asking respondents whether they regarded themselves as prosperous, very comfortable, reasonably comfortable, just getting along, poor or very poor. The results showed that smoking cessation was associated with a lower probability of financial stress and an enhanced level of material well-being. Similarly, in a cross-sectional study of 6892 households in Australia, Siahpush *et al* found that spending money on cigarettes was associated with an increased probability of experiencing financial stress and that among households with a smoker, spending more on tobacco was associated with a higher probability of financial stress.¹³ Similar findings have been reported in the USA, Canada, the UK, Australia and Mexico.¹²¹⁶¹⁸

While the association between cigarette marketing and smoking behaviour, on the one hand, and smoking and financial stress, on the other, have been previously examined, there is no research on the relationship between POS cigarette marketing and financial stress. The rationale for this relationship is that smokers who are exposed to higher levels of tobacco marketing are more likely to develop a craving to smoke,¹⁹ experience urges to buy cigarettes, and make an impulse purchase of cigarettes.⁸ Impulse purchases of cigarettes could in turn promote financial stress by diminishing the available household funds that would otherwise be spent on household essentials such as rent or food. Recent research using causal modelling on data from 939 smokers in the USA found strong evidence that POS cigarette marketing is associated with smoking-induced deprivation (ie, 'money spent on cigarettes resulted in not having enough money for household essentials such as food') and that this association was mediated by cravings to smoke, urges to buy cigarettes and impulse purchases of cigarettes during a visit to a retail store that sells tobacco products.²⁰ A further gap in the previous studies pertaining to smoking and cigarette marketing is that they have measured marketing based on respondents' recall of marketing,⁷⁹¹⁰²¹ which is a subjective assessment of exposure to tobacco marketing and can suffer from recall bias. To address these gaps, our aim was to use store audit data, which is an objective assessment, and examine the association between neighbourhood exposure to POS cigarette price promotions and financial stress among smokers in a Midwestern metropolitan area in the USA.

METHODS

Survey of smokers and measurement of financial stress and other individual-level variables

Individual-level data for this study were collected between August 2013 and June 2014 through telephone interviews of 999 smokers in Omaha, Nebraska.⁸⁹¹⁹²⁰ Participants were recruited using random digit dialling (42.7%) and placement of local advertisements in places such as the major daily newspaper and Craigslist to recruit smokers (52.8%). Our original plan was to use only random digit dialling, but this method proved to be more expensive than we had anticipated, and, as a result, we sought other methods of recruitment. Those included in the study spoke English, were 18 years of age or older, had smoked more than 100 cigarettes in their life, and smoked 5 or more cigarettes a day at the time of the recruitment. Those who responded 'never' to the following question were excluded from the study: 'How often do you visit the stores in the neighbourhood where you live? By stores,

we mean such places as convenience stores, gas stations, grocery stores, supermarkets, drug stores, liquor stores, and tobacco stores.' Response options were '0 = never', '1 = sometimes', '2 = frequently' and '3 = always.' We asked all participants for their home address. The details of the study design and representativeness of the sample are described elsewhere.⁸⁹¹⁹²⁰

Financial stress, which is the study outcome, was measured with the following question: 'In the last six months, because of lack of money, was there a time when you were unable to buy food or pay any important bills on time, such as electricity, telephone, credit card, rent or your mortgage? [Yes/No]'.¹⁸²² An affirmative answer indicated the presence of financial stress.

The following covariates were included in the analysis: impulse purchase of cigarettes, nicotine dependence, sex, age, race/ethnicity, household income, education, frequency of visits to stores in one's neighbourhood and method of recruitment. Impulse purchase of cigarettes was measured with the following question: 'When you are in a store in your neighbourhood to shop for something other than cigarettes, how often do you decide to buy cigarettes?'.⁸²⁰ The response options for these two questions were as follows: 1=never, 2=rarely, 3=sometimes, 4 = often, 5 = always. Nicotine dependence was measured using the Heaviness of Smoking Index (HSI).¹⁰²³ HSI was calculated by summing the scores for time to first cigarette after waking and number of cigarettes smoked per day. Time to first cigarette is scored as follows: <5 min=3 points; 6–30 min=2 points; 31–60 min = 1 point; and >60 min=0 point. Number of cigarettes smoked per day is scored as follows: 1–10=0 point; 11–20=1 point; 21–30=2 points; and >31=3 points. HSI values range from 0 to 6 with higher values indicating higher nicotine dependence. Race/ethnicity was categorised as non-Hispanic white, non-Hispanic black, Hispanic and other. Annual household income was divided into the following groups: <\$15 000, \$15 000–\$34 999 and >=\$35 000. This categorisation placed about a quarter of the respondents in each of the low income and high income groups and half in the middle income group. Education was categorised based on highest grade or year of school completed as follows: less than high school, high school graduate, some college, and college graduate and higher. Method of recruitment was dichotomised into random digit dialling versus other.

Measurement of neighbourhood POS cigarette price promotion scores based on store audits

A list of stores that were licensed to sell tobacco in the Omaha metropolitan area was obtained from the City of Omaha. Between October 2013 and March 2014, a team of two fieldworkers visited these stores to unobtrusively conduct audits on the extent of cigarette price promotions. They were instructed to collect data independently, and compare their data and resolve any disagreements before leaving the premises of a store. Audit data were collected from 504 stores; out of a total of 571 stores in the list, 65 were closed or did not sell tobacco products, and 2 were deemed by the fieldworkers to be unsafe for data collection. Fieldworkers were trained through the website 'StoreAlert' developed by the Campaign for Tobacco-Free Kids and the Battelle Memorial Institute pursuant to grants from the National Cancer Institute, National Institutes of Health.²⁴ The website provides

training guides and a comprehensive virtual tour of a store with extensive cigarette price promotions. Fieldworkers also received extensive field training. In each establishment, they recorded whether there were any exterior or interior cigarette advertisements about any of three types of promotions: (1) a special price, (2) a multipack discount or (3) a free gift with purchase of cigarettes. About 44.2%, 3.2% and 0.6% of stores had exterior promotions for a special price, a multipack discount or a free gift with purchase of cigarettes, respectively. Furthermore, 76.2%, 12.9% and 0.6% of stores had interior promotions for a special price, a multipack discount or a free gift with purchase of cigarettes, respectively. Stores received 1 point for each of the three types of promotions that were present inside and outside of the store. The points were summed to provide a POS cigarette price promotions score capturing the sum of different types of promotions that existed in a given store. Thus, possible scores for each establishment's cigarette promotions could range from 0 to 6, with 0 indicating the absence of any exterior or interior advertisements about promotions and 6 indicating both exterior and interior advertisements for all three types of promotions. The observed range of scores were 0 to 4. The mean was 1.4.

In order to assess an estimate of a participant's total amount of exposure to neighbourhood POS cigarette price promotions, we used the store audit data and summed the POS cigarette price promotion scores over all stores in that participant's neighbourhood. We defined neighbourhood as a road network buffer of 1 km around a participant's residential address^{25–28} and used ArcGIS, which is a geographic information system for working with geographic data and maps, to identify the retail stores in each neighbourhood. All neighbourhoods, except two, overlapped with at least one other neighbourhood. The number of tobacco retail stores in neighbourhoods ranged from 0 to 20, with a mean of 4.9.

Statistical analysis

In all analyses, we excluded cases that had a missing value for any of the individual-level variables in the study. This constituted 5.2% of the sample; there were only two participants who did not provide information on financial stress. Complete case analysis was conducted using logistic regression to compute ORs for the association of neighbourhood POS cigarette price promotion scores and financial stress. Covariates whose *p* values were >0.1 in the bivariate models were not included in the multivariable model.

We also excluded from the analysis 62 participants who had no stores that sold cigarettes in their neighbourhoods and thus had a missing value for neighbourhood POS cigarette price promotion score. We performed sensitivity analyses by assigning a score of zero to the neighbourhood POS cigarette marketing variable of these individuals and found that the *p* values and effect sizes did not appreciably change and that the conclusion of the study remained the same.

We performed further sensitivity analyses by examining the effect on financial stress of neighbourhood exterior and interior POS cigarette price promotion scores separately. We found similar effect sizes and *p* values to when we used total neighbourhood POS cigarette price promotion scores.

We considered including census tract socioeconomic variables as covariates in the analyses. We examined median household income, poverty rate, and percentage of residents who did not finish high school and found no evidence of an association between these variables and the probability of experiencing financial stress.

RESULTS

Table 1 shows the characteristics of the study sample. The correlations between the covariates ranged from weak to moderate. Among the weak correlations were those between impulse purchase of cigarettes and HSI ($r=0.04$), and between income and HSI ($r=-0.04$). Among the moderate correlations were those between income and race/ethnicity (Cramer's $V=0.21$), and income and education ($r=0.3$).

Table 2 provides unadjusted and adjusted ORs for the association of financial stress with neighbourhood POS cigarette price promotions and other covariates. The unadjusted results show that higher levels of neighbourhood POS price promotions ($p<0.001$), and impulse purchase of cigarettes ($p<0.001$) were associated with a higher probability of experiencing financial stress. Older age was associated with a smaller probability of financial stress ($p<0.001$). Race/ethnicity was associated with financial stress ($p=0.006$) such that Hispanics had the highest and non-Hispanic whites had the lowest probability of financial stress. Lower income ($p<0.001$) and education ($p=0.034$) were associated with higher probability of financial stress. Participants who visited stores in their neighbourhoods less frequently and those who were recruited through random digit dialling experienced a lower probability of financial stress ($p<0.001$). HSI and sex were not associated with the probability of financial stress.

The adjusted results provided strong support ($p=0.009$) that a higher level of neighbourhood POS cigarette price promotions is associated with a higher probability of financial stress. A one unit increase in the neighbourhood POS price promotion score was associated with a 5% increase in the odds of reporting financial stress. Consistent with unadjusted result, the adjusted analysis provided evidence that a higher level of impulse purchase of cigarettes ($p=0.001$), a lower level of income ($p<0.001$) and being recruited through a method other than random digit dialling ($p=0.001$) were associated with a higher probability of financial stress. Race/ethnicity was also associated with financial stress ($p=0.047$) such that non-Hispanic blacks had the lowest probability of financial stress, followed by non-Hispanic whites, Hispanics and others. The change in the association of race/ethnicity and financial stress from the unadjusted to adjusted results occurred predominantly after controlling for income. Age and frequency of visits to stores in one's neighbourhood were not found to have an association with financial stress in the adjusted results.

DISCUSSION

In this study we linked data from a survey of smokers and retail store audits to examine the association of neighbourhood POS cigarette price promotions with financial stress. We found that higher levels of price promotions are associated with greater chances of experiencing financial stress.

Our results are consistent with previous findings that smokers who report a higher level of exposure to POS marketing and higher frequency of impulse purchases of cigarettes are more likely to experience ‘smoking-induced deprivation’, defined as situations where spending money on cigarettes results in not having enough money for household essentials such as food.²⁰ Furthermore, our findings that income was negatively associated with the probability of financial stress, while education was not associated with financial stress were consistent with data reported from other studies.¹¹¹³¹⁸ However, in similar studies of the determinants of financial stress, women compared with men and younger compared with older individuals had higher chances of experiencing financial stress.¹¹¹⁸ While the coefficients of the effect of gender and age in the current analysis were consistent with previous studies, the *p* values for these variables were large indicating a null relationship, perhaps due to our sample size which was considerably smaller than in similar studies. Finally, our finding that non-Hispanic white smokers, compared with non-Hispanic black smokers, had a slightly higher probability of experiencing financial stress is consistent with a previous study that examined the association of race/ethnicity with smoking-induced deprivation.²⁰

A strength of this work was that we used an objective measure of POS cigarette price promotions; we based our measurement on store audit data rather than participants’ recollection of how much marketing they have noticed in the stores in their neighbourhoods, which has been the common method of measuring POS cigarette marketing in previous studies.⁷⁹¹⁰²¹ Using data recorded during store audits to quantify cigarette price promotions rather than eliciting smokers’ recollections of cigarette price promotions is important because the latter is subject to recall bias and because conscious recognition of marketing is not the only influence on consumer behaviour. The aspects of the environment that are not consciously perceived by the consumer may influence behaviour and lead to decision processes that take place entirely outside the realm of awareness.^{29–32}

Four weaknesses of the study are worth mentioning. First, the study measured neighbourhood rather than overall exposure to POS cigarette price promotions. It is possible that some smokers are exposed to cigarette price promotions outside their neighbourhood, for example, in the vicinity of their workplace. An ideal measurement would entail compiling a list of stores a smoker visits and assess the overall POS exposure to price promotions for that smoker. Second, because the study was cross-sectional, the results cannot be used to establish causality. While it is plausible that exposure to price promotions can lead to impulse purchases of cigarettes,⁸ diminish financial resources, and lead to financial stress, it is also possible that price promotions are used more often in neighbourhoods where more people suffer from financial stress and socioeconomic disadvantage,³³ indicating that financial stress can cause exposure to more price promotions. Third, our measurement of exposure to POS cigarette promotions assumes that study participants visited every tobacco retailer in their neighbourhood. While we controlled for the frequency of visits to stores, it is possible that some of the study participants were not aware of all the stores that sold cigarettes and had cigarette price promotions in their neighbourhoods. Fourth, the study did not control for the number of stores in a neighbourhood. In our study, the correlation between this variable and POS price promotions in a neighbourhood was 0.9. This strong correlation would have resulted in a problem with

multicollinearity in the multiple regression model and thus we were unable to include both variables in the analysis. Research is needed to disentangle the effect of number of stores that sell cigarettes and the amount of cigarette price promotions in a neighbourhood.

The experience of financial stress is important because it indicates lower standards of living,^{2234–36} and because it can lead to further unfavourable smoking behaviours and outcomes. For example, smokers with financial stress are more likely to continue smoking and ex-smokers with financial stress are more likely to relapse.³⁵ Furthermore, smokers with financial stress are more likely to be interested in quitting but less likely to attempt to quit or succeed in quitting.²² Similarly, smokers who report smoking-induced deprivation are less likely to attempt to quit smoking and those who do try to quit are more likely to relapse.³⁴ The reason financial stress, or any form of stress, can affect smoking behaviour is that smokers perceive smoking to have anxiolytic properties and often use it as a coping mechanism to deal with stress.³⁷ Smokers tend to smoke more during stressful times and, as a result, become more dependent on nicotine and find it harder to quit.³⁸³⁹ Financial stress is possibly a stronger predictor of smoking behaviour than other forms of stress because financial stress involves the perception of a tangible threat to a person's material conditions of life.²² For example, not being able to pay rent poses the threat of eviction and homelessness. Overall, evidence shows that the relationship between smoking and financial stress is bidirectional, and smokers are often caught in a vicious cycle of experiencing financial stress because of continued smoking and not being able to quit because of the financial stress that is a result of continued smoking. Our finding that exposure to POS cigarette price promotions is associated with financial stress suggests that such price promotions may further exacerbate this vicious cycle and act as an impediment to successful smoking cessation.

Acknowledgments

Funding: Research reported in this publication was supported by NIH grant R01CA166156 and FDA Center for Tobacco Products (CTP). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.

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What this paper adds

- ▶ Smokers who are exposed to more cigarette marketing are less likely to quit smoking. Continued smoking is likely to exacerbate financial stress.
- ▶ The association of POS cigarette promotions such as special prices or multi-pack discounts with financial stress has never been examined.
- ▶ This study provided evidence that smokers who live in neighborhoods with a higher level of POS cigarette promotions are more likely to experience financial stress.

Table 1Sample characteristics ^a (n=888)

Variables	% or mean	SD and range
Financial stress		
Yes	24.2	–
No	75.8	–
Neighbourhood point-of-sale (POS) promotions	8.1	5, 0–27
Impulse purchase	2.8	1.2, 1–5
Heaviness of Smoking Index (HSI)	3.2	0.9, 1–6
Sex		
Male	42.9	–
Female	57.1	–
Age (years)		
18–24	7.9	–
25–39	21	–
40–54	36.9	–
55+	34.2	–
Race/ethnicity		
Non-Hispanic white	65	–
Non-Hispanic black	25.1	–
Hispanic	3	–
Other	6.9	–
Income (\$)		
< 15000	25.8	–
15000–34999	45.8	–
35000+	28.5	–
Education		
Less than high school	10.5	–
High school graduate	40.3	–
Some college	36.8	–
College graduate	12.4	–
Frequency of visits to stores	2.4	0.7, 2–4
Method of recruitment		
Random digit dialling	44.7	–
Other	55.3	–

^a* Data were collected in Omaha, Nebraska, in 2013 and 2014.

Table 2

Unadjusted and adjusted associations of financial stress with neighbourhood point-of-sale (POS) cigarette price promotions and other covariates (n=888)

	Unadjusted OR	p value	Adjusted* OR	p value
Neighbourhood POS promotions	1.06 (1.03–1.09)	<0.001	1.04 (1.01–1.08)	0.009
Impulse purchase	1.49 (1.31–1.7)	<0.001	1.28 (1.1–1.49)	0.001
Heaviness of Smoking Index (HSI)	1.13 (0.96–1.33)	0.152	–	–
Sex		0.406		
Male	0.88 (0.64–1.2)		–	–
Female	1.00		–	–
Age (years)		<0.001		0.094
18–24	1.00		1.00	
25–39	0.94 (0.53–1.68)		0.98 (0.53–1.8)	
40–54	0.6 (0.35–1.04)		0.78 (0.43–1.41)	
55+	0.3 (0.17–0.55)		0.54 (0.29–1.03)	
Race/ethnicity		0.006		0.047
Non-Hispanic white	1.00		1.00	
Non-Hispanic black	1.17 (0.82–1.68)		0.66 (0.44–0.99)	
Hispanic	3.32 (1.52–7.25)		1.68 (0.72–3.91)	
Other	1.88 (1.07–3.3)		1.29 (0.7–2.39)	
Income (\$)		<0.001		<0.001
< 15000	1.00		1.00	
15000–34999	0.67 (0.47–0.94)		0.67 (0.46–0.98)	
35000+	0.17 (0.1–0.28)		0.23 (0.13–0.42)	
Education		0.034		0.5
Less than high school	1.00		1.00	
High school graduate	0.91 (0.54–1.53)		1.29 (0.74–2.26)	
Some college	0.96 (0.57–1.61)		1.54 (0.87–2.73)	
College graduate	0.43 (0.21–0.88)		1.36 (0.62–3.02)	
Frequency of visits to stores	1.4 (1.1–1.78)	0.004	1.22 (0.94–1.59)	0.138
Method of recruitment		<0.001		0.001
Random digit dialling	0.28 (0.2–0.4)		0.5 (0.34–0.74)	
Other	1.00		1.00	

* Adjusted for the effect of all covariates in the model.