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Cigarette prices, cigarette expenditure and smoking-induced deprivation: findings from the International Tobacco Control Mexico survey

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Abstract

Aim—Mexico implemented annual tax increases between 2009 and 2011. We examined among current smokers the association of price paid per cigarette and daily cigarette expenditure with smoking-induced deprivation (SID) and whether the association of price or expenditure with SID varies by income.

Methods—We used data (n = 2410) from three waves of the International Tobacco Control Mexico survey (ie, 2008, 2010, 2011) and employed logistic regression to estimate the association of price paid per cigarette and daily cigarette expenditure with the probability of SID (‘In the last 6

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months, have you spent money on cigarettes that you knew would be better spent on household essentials like food?’).

Results—Price paid per cigarette increased from Mex \$1.24 in 2008, to Mex\$1.36 in 2010, to Mex\$1.64 in 2011. Daily cigarette expenditure increased from Mex \$6.9, to Mex\$7.6 and to Mex \$8.4 in the 3 years. There was no evidence of an association between price and SID. However, higher expenditure was associated with a higher probability of SID. There was no evidence that the association of price or expenditure with SID varied by income.

Conclusion—Tax increases in Mexico have resulted in smokers paying more and spending more for their cigarettes. Those with higher cigarette expenditure experience more SID, with no evidence that poorer smokers are more affected.

INTRODUCTION

While the effectiveness of taxation as a tobacco control strategy is well established,^{1–6} there is concern that increasing the price of cigarettes could result in excess financial difficulties among smokers, particularly those from lower income groups, who continue smoking.^{27–9}

An important aspect of the financial burden of smoking is the fact that tobacco expenditure among smokers may result in not having enough money for household essentials such as food. This notion has been referred to as ‘smoking-induced deprivation’ (SID).^{10–12} Using representative samples of smokers from the USA, Canada, the UK and Australia, we examined the correlates of SID and found that younger age, minority status, lower income and higher nicotine dependence were associated with a higher probability of SID.¹⁰ We measured SID with the question ‘In the past 6 months, have you spent money on cigarettes that you knew would be better spent on household essentials like food?’ In a more recent study, we used data from the same four countries to examine how cigarette expenditure is related to SID, which was measured with a question that had a slightly different wording: ‘In the last 6 months, has there been a time when the money you spent on cigs resulted in not having enough money for household essentials such as food?’¹¹ We found that higher cigarette expenditure was associated with a higher probability of experiencing SID. The correlates of SID have not been examined in low or middle-income countries.

In Mexico, between 2007 and 2011, cigarette taxes were increased on an annual basis in the January of each year (58.9% in 2007, 60.2% in 2008, 61.4% in 2009, 62.7% in 2010 and 68.8% in 2011).¹³ Previous research on the effect of the 2007 tax increase indicated that the policy resulted in an increase in prices paid for cigarettes.¹⁴ There is no research on how price and expenditure are associated with SID in Mexico. The purpose of this article was to investigate the association of the price paid per cigarette and daily cigarette expenditure with the probability of experiencing SID, and whether the association of price or expenditure with SID varies by income group.

METHODS

Data

Data were limited to current smokers drawn from wave 3 (November to December 2008), wave 4 (January to February 2010) and wave 5 (April to May 2011) of the International Tobacco Control Mexico survey, which is the only population-based representative cohort of smokers available in the country.¹⁵ In urban areas of six major cities (Mexico City, Guadalajara, Monterrey, Tijuana, Puebla, Mérida) data were collected at all three of these waves. A stratified, multistage sampling strategy was used, wherein census tracts and then two block groups within each tract were selected with probability proportional to the number of households according to the 2005 census. Households in each selected block group were listed, selected at random, and visited up to four times to enumerate household members and recruit smokers who were 18 years of age or older, smoked more than 100 cigarettes in their lifetime, and smoked at least once in the previous week.¹⁶ The retention rate from wave 3 to wave 4 was 75%, whereas it was 86% from wave 4 to wave 5. Samples were replenished to maintain sample size at each wave through the random selection of block groups within already selected census tracts that had the lowest levels of follow-up. The same procedures for randomly selecting smokers were followed as when establishing the cohort. Totals of 1760, 1840 and 1845 respondents were interviewed in waves 3, 4, and 5, respectively, including smokers who quit over the study period. Details of the methodology are described elsewhere.¹⁶

Measurement

SID was measured with the question 'In the last 6 months, have you spent money on cigarettes that you knew would be better spent on household essentials like food? Yes/No'.¹⁰

Price paid per cigarette was computed using responses to the question 'The last time you bought cigarettes for yourself, did you buy them by the carton, the pack, or as single cigarettes?' and the questions that followed, which asked respondents about how much they paid for the cigarettes. Daily expenditure on cigarettes was computed by multiplying the price paid per cigarette with the average number of cigarettes smoked per day. Daily smokers were asked 'On average, how many cigarettes do you smoke each day?' and non-daily smokers were asked 'On average how many cigarettes do you smoke each week?' Both price and expenditure were adjusted for inflation using the year 2005 as the base year.

The number of cigarettes smoked per day was dichotomised to distinguish those who smoke less than five from those who smoke more than five cigarettes per day. We used this variable as an indicator of nicotine dependence. Purchase of discounted cigarettes was from a question asking about whether the respondent bought discounted cigarettes in the past month. Annual household income was categorised into low (under Mex \$3000), medium (Mex\$3000–8000) and high (Mex\$8001+). Similarly, education was categorised into low (primary school or less), medium (middle, technical/vocational or high school completed) and high (more than high school). The number of friends who smoke was measured with the

question ‘Of the five closest friends or acquaintances that you spend time with on a regular basis, how many of them are smokers?’

Statistical analysis

Weighted data were used to compute point estimates. Multiple logistic regression was employed to examine the effect of predictors on SID. Separate models were estimated for the effect of cigarette price and daily expenditure. Cases with missing values (6.2% of the sample) for any of the study variables, except income, were excluded from the analysis. We also conducted analyses in which cases with missing income data were excluded and found no appreciable difference in the results. We used generalised estimating equations to take into account the correlated nature of the data, which is characterised by a condition in which observations within an individual are more similar than observations across individuals.¹⁷ We assumed an unstructured covariance pattern in which the elements of the covariance matrix among repeated measures are unconstrained. To examine whether price or expenditure had an interaction with income, we assessed the p value for the effect of the product terms for income and price, and income and expenditure. We also examined the influence of year of recruitment and found it to have no association with SID.

Overall, 2410 respondents who reported being current smokers at a given wave were included in the analysis, of whom 1130 participated in one wave, 673 participated in two waves and 607 participated in three waves of interviews for data collection. In total, 4297 person-wave observations were in the final regression model.

RESULTS

Table 1 shows that price paid per cigarettes increased from Mex\$1.24 2008, to Mex\$1.36 in 2010 and Mex\$1.64 in 2011. Similarly, daily cigarette expenditure increased from Mex \$6.90, to Mex\$7.60 and Mex\$8.37, respectively. The percentage of respondents experiencing SID changed from 17.2 to 25.1 to 21.5 in the 3 years of the study.

Table 2 shows the association of price, expenditure, and other covariates with SID. While price paid per cigarette had no association with SID, spending an extra Peso on cigarettes each day was associated with a 2% (95% CI 1.01 to 1.04) higher odds of experiencing SID. Purchasing discounted cigarettes, smoking five or more cigarettes per day, being a daily smoker, being a woman, being younger and having lower levels of income or education were associated with higher odds of SID. Smokers interviewed in Tijuana had the lowest odds of SID, while those interviewed in Puebla has the highest odds of SID. We found no evidence of an interaction between price ($p = 0.785$) or expenditure ($p = 0.625$) with income. Therefore, interaction terms were not included in the multivariate models.

DISCUSSION

The tax increases between 2009 and 2011 in Mexico resulted in an increase in the real price paid per cigarettes and daily cigarette expenditure. We found that there was an association between higher cigarette expenditure and experiencing SID, which was not moderated by income. This finding was consistent with our recent study of smokers in the USA, Canada,

the UK and Australia.¹¹ Price was not associated with SID, most likely because many smokers reduce their cigarette consumption when prices increase.¹⁴

While the sample was broadly representative of the population of smokers in Mexico, it did not include highly disadvantaged groups such as the homeless or people living in rural areas. Therefore, the results cannot be generalised to these groups. While the measurement of SID has been validated in the past,¹⁰ we do not know of any studies that have assessed its reliability. Furthermore, because it asks about expenditure patterns dating back to 6 months, it is subject to recall bias. Future research can focus on a more objective measure of SID, similar to the measurement of lack of 'financial protection' in health economics, which is defined in terms of whether or not a household's spending (eg, cigarette expenditure) exceeds a certain percentage of living standards or results in the household falling below the poverty line.^{18–20}

The aim of this research was to examine the correlates of SID, and the results should not be taken as indicating that higher expenditure on cigarettes leads to or causes deprivation. In our future research, we intend to examine the causal relationship between these variables using subject-specific models, which allow conclusions about the extent to which changes in price or expenditure from one time point to the other are associated with a change in SID.

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Key messages

Cigarette tax increases in Mexico in recent years have resulted in an increase in the real price of cigarettes and cigarette expenditure by smokers. Spending more on cigarettes, in turn, is associated with higher chances of experiencing smoking-induced deprivation (SID). The association of cigarette expenditure and SID does not vary by income level.

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Table 1

Weighted sample characteristic by survey year

	2008	2010	2011	p Value*
Price paid per cigarette (mean in Mex\$)	1.24	1.36	1.64	<0.001
Cigarette expenditure (mean in Mex\$)	6.90	7.60	8.37	<0.001
Purchase of discounted cigarettes				
Yes	7.59	5.80	7.31	0.078
No	92.41	94.20	92.69	
SID				
Yes	17.24	25.14	21.48	<0.001
No	82.76	74.86	78.52	
No of cigarettes smoked per day				
Five or less	55.39	52.63	53.33	0.909
More than five	44.61	47.37	46.67	
Daily smoker				
Yes	64.72	67.22	66.08	0.939
No	35.28	32.78	33.92	
No of friends who smoke (mean)	3.22	3.17	3.00	0.148
Sex				
Male	62.60	61.85	61.15	0.088
Female	37.40	38.15	38.85	
Age, years (mean)	39.29	40.90	41.40	0.001
Income				
Low	23.54	26.28	21.93	0.372
Medium	44.86	45.75	55.79	
High	20.96	21.09	15.26	
No information	10.64	6.88	7.03	
Education				
Low	27.19	31.21	29.46	0.030
Medium	56.09	53.4	55.57	
High	16.72	15.39	14.97	

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City	2008	2010	2011	p Value*
Tijuana	14.32	15.98	15.93	0.645
Mexico City	22.56	23.32	23.47	
Guadalajara	16.93	15.33	15.18	
Monterrey	15.74	15.11	15.07	
Puebla	15.40	15.16	11.18	
Mérida	15.06	15.11	15.18	

* p Value for the association of year and covariates.

Table 2

Adjusted* OR and 95% CI for the effect of covariates on SID (n = 4297 person-waves)

	Adjusted OR	p Value	Adjusted OR	p Value
Price paid per cigarette (Mex\$)	0.94 (0.81 to 1.10)	0.441	—	
Cigarette expenditure (Mex\$)	—		1.02 (1.01 to 1.04)	<0.001
Discounted cigarettes				
Yes	2.01 (1.54 to 2.64)	<0.001	1.93 (1.47 to 2.54)	<0.001
No	1.00		1.00	
No of cigarettes smoked per day				
Less than five	0.59 (0.49 to 0.71)	<0.001	0.74 (0.60 to 0.91)	0.004
Five or more	1.00		1.00	
Daily smoker				
Yes	1.52 (1.23 to 1.87)	<0.001	1.43 (1.16 to 1.77)	0.001
No	1.00		1.00	
No of friends who smoke	1.00 (0.95 to 1.04)	0.950	1.00 (0.95 to >1.04)	0.875
Sex				
Male	1.00	0.029	1.00	0.017
Female	1.20 (1.02 to 1.42)		1.22 (1.04 to 1.44)	
Age	0.99 (0.99 to 1.00)	0.004	0.99 (0.99 to 1.00)	0.004
Income				
Low	1.00	<0.001	1.00	0.001
Medium	0.77 (0.64 to 0.92)		0.77 (0.64 to 0.92)	
High	0.72 (0.56 to 0.93)		0.72 (0.56 to 0.92)	
No information	0.55 (0.40 to 0.77)		0.55 (0.40 to 0.77)	
Education				
Low	1.00	<0.001	1.00	<0.001
Medium	0.74 (0.62 to 0.90)		0.74 (0.62 to 0.90)	
High	0.58 (0.44 to 0.77)		0.59 (0.44 to 0.77)	
Year				
2008	0.76 (0.62 to 0.92)	<0.001	0.81 (0.67 to 0.97)	<0.001
2010	1.16 (0.98 to 1.39)		1.22 (1.03 to 1.45)	
2011	1.00		1.00	
City				
Tijuana	0.27 (0.19 to 0.38)	<0.001	0.25 (0.18 to 0.36)	<0.001
Mexico City	1.00		1.00	
Guadalajara	0.96 (0.74 to 1.24)		0.97 (0.75 to 1.26)	
Monterrey	1.41 (1.11 to 1.79)		1.33 (1.05 to 1.69)	
Puebla	1.67 (1.31 to 2.13)		1.66 (1.30 to 2.11)	
Mérida	0.62 (0.47 to 0.82)		0.59 (0.45 to 0.79)	

* Adjusted for all covariates. Price and expenditure are included in separate models.

SID, smoking-induced deprivation.