Perceived Price Sensitivity by Ethnicity and Smoking Frequency Among California Hispanic and Non-Hispanic White Smokers

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Abstract

Objectives: Little is currently known about price sensitivity across ethnic groups as well as for non-daily smokers. To address this issue, this study compared perceived price sensitivity across smoking status (daily and non-daily) and within ethnicity (Hispanic and non-Hispanic White) in a recent representative population survey of California smokers.

Methods: This study employed data from the 2008 California Tobacco Survey (CTS), a large population-based random-digit-dialed telephone survey. Participants were 1,777 non-Hispanic White and 450 Hispanic respondents who had smoked at least 100 cigarettes and currently smoked daily or on some days.

Results: Differences in perceived price sensitivity were found by ethnicity when controlling for age, gender, and cigarette consumption. Comparisons across ethnic groups indicated that Hispanic smokers, in general, have more price-sensitive perceptions than non-Hispanic White smokers. However, daily versus non-daily status had no effect on price sensitivity when controlling for cigarette quantity.

Conclusions: These findings indicate that pricing increases may be differentially influential for Hispanic compared with non-Hispanic White smokers across smoking status categories.

Introduction

National- and state-level tobacco control policies and strategies have been effective in changing the prevalence and nature of smoking behaviors in the United States. In California, the Tobacco Control Program has contributed to an almost 30% decline in smoking prevalence since 1990 (Al-Delaimy, Pierce et al., 2007) as well as modification of smokers’ smoking behaviors (Pierce, White, & Messer, 2009). The majority of smokers are no longer heavy, daily smokers. In 2008, more than 68% of all adult smokers in California were light or non-daily smokers (Al-Delaimy et al., 2010). These changes have been attributed to the California Comprehensive Tobacco Control Program that involved several tobacco control policies including increased cigarette taxes, anti-tobacco media program, and restrictions on smoking in public places (Al-Delaimy, Pierce et al., 2007; Pierce et al., 2009). This has led to increased social stigma against smoking, and smokers who did not quit decreased their level of cigarette consumption (Al-Delaimy, Pierce et al., 2007). In particular, the proportion of non-daily smokers has increased in recent years, reaching 30% in 2008 (Al-Delaimy et al., 2010). Until quite recently, non-daily smokers have received limited research or tobacco control policy attention because they are not considered physiologically dependent on nicotine (Nguyen & Zhu, 2009; Pierce et al., 2009), typically do not progress to heavier smoking (Levy, Biener, & Rigotti, 2009), and comprise a small percentage of the population. As such, little information is available to guide tobacco control policies that may reach these low-rate smokers.

Increases in the proportion of non-daily smokers have been observed among women, racial ethnic minorities, and those with higher education (Zhu, Pulvers, Zhuang, & Baezconde-Garbanati, 2007). Non-daily smokers consist of two distinct groups: (a) former daily non-daily (FDND) smokers are daily smokers who cut down their smoking to become less-than daily smokers and (b) never daily non-daily (NDND) smokers are individuals who never developed a daily smoking habit, but continued smoking occasionally (Gilpin, Cavin, & Pierce, 1997). The differences in the smoking history and trajectories of these distinct groups of non-daily smokers suggest they may differ in susceptibility to tobacco control policies.
Perceived price sensitivity by ethnicity and smoking frequency

Investigations consistently identify Hispanics as more likely to be lighter and less frequent smokers than individuals of other ethnic/racial groups (Gilpin et al., 1997; Trinidad et al., 2009; Zhu et al., 2007). For example, a recent study compared intermittent (less than daily) and light (one to five cigarettes per day) smoking across racial and ethnic groups in the United States (Trinidad et al., 2009). Hispanic smokers were found to have the highest likelihood of being both intermittent and light smokers in comparison to Black, Asian, and non-Hispanic White smokers. Because Hispanics are overrepresented among non-daily smokers, it is important to consider potential ethnic differences in perceptions of tobacco control policies.

Evidence shows that increased cigarette prices are associated with reduced consumption and increased smoking cessation efforts (Levy, Romano, & Mumford, 2005; Reed, Anderson, Vaughn, & Burns, 2008; Ross, Blecher, Yan, & Hyland, 2011). This is driven by the well-known economic concept of price sensitivity, which indicates an inverse correlation between price and purchasing (Kaul & Wittink, 1995). Little is currently known about price sensitivity for non-daily smokers, and findings to date are inconsistent. Evidence exists that cigarette taxes reduce smoking for daily and non-daily smokers; however, these effects vary by gender and age (Au, 2009). Other studies relevant to this topic have examined price sensitivity among populations with high prevalence of non-daily smokers such as youth and ethnic minority groups. For youth, studies generally show increased price sensitivity compared with older smokers (Franz, 2008). However, recent evidence indicates adolescent response to price increases may be explained by peer and family effects rather than cost (Ali, 2008). Similarly, the influence of cigarette price on smoking behaviors in other populations with higher prevalence of non-daily smokers has not yielded consistent findings, with some indicating differences by gender, income level, age, and ethnicity (Farrelly, Bray, Pechacek, & Woolery, 2001; Hersh, 2000; Siahpush, Wakefield, Spittal, Durkin, & Scollo, 2009) and others finding no differences in price sensitivity across these factors (Dinno & Glantz, 2009; Schaap et al., 2008). These inconsistent findings in responsiveness to price increases highlight the value of examining price sensitivity across daily and non-daily smoking subgroups in different ethnic groups.

We were unable to identify any studies that directly compared price sensitivity between daily and non-daily smokers, or that considered differences between FDND and NDND smokers. Additionally, Hispanic smokers are the ethnic group with the highest proportion of non-daily smokers in California. To address this issue, this study examines perceived price sensitivity in a recent representative population survey of California smokers. As such, we are examining subjective self-reported responses of potential behavior change in reaction to increased prices. This is in contrast to price sensitivity (or responsiveness to price changes), which is measured using price elasticity of demand (i.e., actual changes in consumption in response to increased prices). Participant responses to items querying perceptions of smoking behavior change in response to cigarette prices are employed to evaluate price sensitivity. Perceived price sensitivity is compared across and within smoking status (daily, NDND, and FDND) and across ethnicity (Hispanic and non-Hispanic White).

METHODS

Participants

This study employed data from the 2008 California Tobacco Survey (CTS) (CTCP, 2007), a large population-based random-digit-dialed telephone survey conducted between September 2008 and January 2009, to monitor tobacco use and attitudes in California. The methods for the CTS are described elsewhere in detail (Al-Delaimy, Messer, Pierce, Trinidad, & White, 2007). Survey procedures were approved by the University of California, San Diego Human Research Protection Program. In brief, land-line-based telephone samples are drawn within each of the 12 designated regions in California. For the survey, an adult (aged ≥18 years) in each responding household describes household residents, providing demographic and smoking status information for each. A stratified random sample of 10,397 adults completing the household survey was selected for an extended interview based on this information, with current smokers and former smokers who quit within the last 5 years more likely to be selected; the resulting sample was probability weighted by age, ethnicity, and geographic sampling stratum, so that population parameter estimates can be calculated. This study reports extended interview data from respondents who were current established smokers of non-Hispanic White or Hispanic ethnicity (n = 2,227) composed of 1,777 non-Hispanic White and 450 Hispanic respondents who had smoked at least 100 cigarettes in their lifetime, had smoked in the past 30 days, and currently smoked daily or on some days. Participants consisted of 50% female and 20% Hispanic, and were on average 48.0 years of age (SD = 16.2). We did not include smokers of other races and ethnicities because of small sample sizes that would preclude meaningful analysis: N = 223 African Americans (54 non-daily smokers), and 98 Asians (26 non-daily smokers).

Ethnicity/Race

Ethnicity and race were assessed with standard items on the CTS to permit examining tobacco use and related factors across ethnic and racial categories. To establish ethnicity, all participants were asked if they were “Hispanic or Latino.” Next, participants were asked to describe their racial background. Participants classified as Hispanic in this study were those that reported they were Hispanic or Latino. Those classified as non-Hispanic White were those that reported they were not Hispanic or Latino and endorsed “White” in response to the racial background question.

Smoking Status

All respondents in this study reported having smoked at least 100 cigarettes in their lifetime and had smoked in the past 30 days. Smoking status was then defined based on their responses to the item “Do you smoke cigarettes every day, some days or not at all?” Respondents who reported smoking every day were classified as daily smokers, while those who reported smoking on some days were labeled non-daily smokers. The non-daily smokers were further categorized based on whether they had ever smoked daily for at least 6 months. Non-daily smokers who reported having smoked daily for at least 6 months were categorized as FDND smokers, while those who had not smoked daily were categorized as NDND smokers.
Price Sensitivity

Five CTS items addressing perceived price sensitivity were used in this study:

“Are you worried about how much money you spend on cigarettes?; Has the price of cigarettes influenced how much you smoke?; Has the price of cigarettes influenced where you buy cigarettes?; Has the price of cigarettes influenced which brand you buy?; Has the price of cigarettes influenced your desire to quit?” Response options for each item were Yes or No.

Analytic Plan

Analyses in this article are based on non-Hispanic White and Hispanic household survey participants 18 years of age and over (N = 2,227). Unweighted summary statistics were used to describe the composition of the study sample. However, all population parameter estimates are weighted to be representative of the state of California age and gender distribution of the respective subpopulations characterized using survey sample weights from the CTS as previously described (Al-Delaimy, Messer et al., 2007).

Comparisons were conducted across smoking patterns and ethnicity for five price sensitivity variables. Specifically, comparisons were conducted to identify significant differences for each price sensitivity item within and across smoking status groups, overall and by ethnicity. Separate weighted logistic regressions were computed, controlling for age, gender, and cigarette consumption (log number of cigarettes smoked per month). Standard errors and p-values were calculated using jackknife replicate weights as previously described (Al-Delaimy, Messer et al., 2007). A family-wise correction was applied to account for multiple analyses (Dar, Serlin, & Omer, 1994), with significance level set at p = .01.

RESULTS

The distribution of smokers by smoker type (daily, FDND, and NDND) and by demographic factors is summarized in Table 1. Non-Hispanic White smokers were significantly more likely than Hispanic smokers to be daily smokers (75% vs. 63%, p < .001) and significantly less likely to be NDND smokers (8% vs. 22%, p < .001), and approximately equally likely to be FDND smokers (16% vs. 15%, p = .571).

Next, we examined models separately for daily smoking status across ethnicity, followed by similar analyses stratified by ethnicity. For the global comparison across smoking status, there were no significant differences between daily and non-daily smokers when controlling for cigarette frequency. Findings were similar in stratified analyses examining price sensitivity as a function of smoking status for Hispanic and non-Hispanic White smokers separately. As shown in Table 2, price sensitivity did not differ significantly for daily versus non-daily smokers when controlling for cigarette quantity. These models indicated that greater quantity of cigarettes was significantly associated with several price sensitivity items. Thus, in the present sample price sensitivity appears linked to overall consumption of cigarettes rather than daily smoking status.

When comparing non-Hispanic White and Hispanic daily smokers (Table 3), Hispanic smokers were significantly more likely to endorse that price would influence the brand of cigarettes purchased (OR = 2.12, p < .001). In addition, Hispanic daily smokers were more likely to report that price would influence how much they smoked (OR = 1.60, p = .012) and their desire to quit (OR = 1.45, p = .060). Comparison of

| Table 1. Population-Weighted Distribution of Daily, FDND, and NDND Smokers |
|-----------------------------|-----------------------------|-----------------------------|
|                            | Daily smokers (%) | FDND smokers (%) | NDND smokers (%) |
| Overall                     | Hispanic White       | 63              | 15             | 22             |
|                            | Non-Hispanic White   | 76              | 16             | 8              |
| Female                      | Hispanic White       | 71              | 14             | 15             |
|                            | Non-Hispanic White   | 76              | 17             | 7              |
| Male                        | Hispanic White       | 59              | 16             | 25             |
|                            | Non-Hispanic White   | 75              | 16             | 9              |

Note. FDND = former daily non-daily; NDND = never daily non-daily.

| Table 2. Perceived Price Sensitivity by Daily Versus Non-Daily Smoking Status for Hispanic and Non-Hispanic White Smokers |
|-----------------------------|-----------------------------|-----------------------------|
|                            | Hispanic White | Non-Hispanic White |
| Item                        | ORa 95% CI | p value | ORa 95% CI | p value |
| Money you spend             | 0.70 0.22–2.18 | .533   | 1.00 0.55–1.83 | .998   |
| How much you smoke          | 0.54 0.19–1.55 | .252   | 1.23 0.67–2.25 | .503   |
| Where you buy               | 0.72 0.21–2.47 | .603   | 0.92 0.56–1.53 | .759   |
| Which brand you buy         | 0.92 0.32–2.69 | .881   | 1.16 0.67–2.04 | .594   |
| Your desire to quit         | 1.03 0.34–3.16 | .958   | 1.32 0.78–2.24 | .295   |

Note. Reference group = non-daily smokers.
aOR = odds ratio after controlling for age, gender, cigarette quantity (log transformed number of cigarettes smoked per month), and age by gender interaction.
Perceived price sensitivity by ethnicity and smoking frequency

Table 3. Perceived Price Sensitivity by Ethnicity for Daily and Non-Daily Smokers

<table>
<thead>
<tr>
<th>Item</th>
<th>Daily smokers</th>
<th>Non-daily smokers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR(^a)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Money you spend</td>
<td>1.23</td>
<td>0.80–1.89</td>
</tr>
<tr>
<td>How much you smoke</td>
<td>1.60</td>
<td>1.11–2.30</td>
</tr>
<tr>
<td>Where you buy</td>
<td>1.02</td>
<td>0.70–1.50</td>
</tr>
<tr>
<td>Which brand you buy</td>
<td>2.12</td>
<td>1.46–3.08</td>
</tr>
<tr>
<td>Your desire to quit</td>
<td>1.45</td>
<td>0.99–2.12</td>
</tr>
</tbody>
</table>

*Note.* Reference group = White.

\(^a\)OR = odds ratio after controlling for age, gender, cigarette quantity (log transformed number of cigarettes smoked per month), and age by gender interaction.

non-Hispanic White versus Hispanic non-daily smokers likewise identified a number of differences. Specifically, Hispanic non-daily smokers were significantly more likely to report that price influenced whether they smoked (OR = 2.13, \(p = .009\)) and their desire to quit (OR = 2.77, \(p < .001\)). In addition, they tended to be more likely to report concern about the money they spend on cigarettes (OR = 1.85, \(p = .045\)) and that price would influence the brand they buy (OR = 2.10, \(p = .020\)) in comparison with White non-daily smokers. Thus, comparison of perceived price sensitivity by ethnicity within smoking status groups revealed that Hispanic daily and non-daily smokers were more price sensitive than non-Hispanic White smokers.

Differences in responses to price sensitivity items were examined within non-daily smokers, comparing non-daily smokers who had never smoked daily (NDND) versus former daily, current non-daily smokers (FDND). When comparing price sensitivity responses for all non-daily smokers (non-Hispanic White and Hispanic) and for Hispanic non-daily smokers only, no statistically significant differences were observed (all \(p\) values >.13). Among non-Hispanic Whites, a trend toward significance was observed whereby FDND smokers were more likely than NDND to report that price would influence the brand they buy (OR = 2.98, \(p = .039\)) and their desire to quit (OR = 2.22, \(p = .017\)). Thus, when comparing price sensitivity across non-daily smoking categories, no significant differences emerged on price sensitivity. As shown in Table 4, we next compared perceived price sensitivity by ethnicity within non-daily smokers, separately for NDND and FDND smokers. Within NDND smokers, Hispanics were significantly more likely to report that price would influence their desire to quit smoking (OR = 4.81, 95% CI = 2.35–9.83, \(p < .001\)). A nonsignificant trend was observed whereby Hispanics were more likely to report that price would influence how much they smoke (OR = 2.28, \(p = .042\)) and the brand they buy (OR = 3.14, \(p = .044\)). Within the FDND non-daily smoking category, Hispanics were significantly more likely than non-Hispanic Whites to report that price would influence smoking quantity (OR = 2.61, 95% CI = 1.29–5.27, \(p = .008\)). In addition, nonsignificant trends were observed such that Hispanic FDND smokers were more likely to report concern about money spent on cigarettes (OR = 2.78, \(p = .032\)), and that price would influence which brand they would buy (OR = 2.21, \(p = .082\)) than were non-Hispanic White FDND smokers. Thus, examination of price sensitivity by ethnicity within non-daily smoking categories revealed greater price sensitivity for Hispanic than non-Hispanic Whites both among NDND smokers and FDND smokers.

Finally, in order to evaluate whether socioeconomic status (SES) influences price perceptions, we explored the effect of education as a covariate on the analyses of perceived price sensitivity comparisons between daily and non-daily smokers as well as between NDND and FDND smokers. Education was employed as a proxy for SES because income data were not available for a significant proportion of participants. Inclusion of education as a covariate did not change the relationship between ethnicity and the price sensitivity variables for either daily or non-daily smokers. However, greater education significantly predicted a lower likelihood of price influencing desire to quit for daily smokers (OR = .85 per year of education, \(p = .006\)), and which brand was purchased for non-daily smokers (OR = .89 per year of education, \(p = .004\)). Next, education was examined as a covariate for analyses examining price sensitivity for NDND and FDND smokers. Inclusion of education as a covariate increased the relationship between ethnicity and the items reflecting concern about money spent on smoking (OR increased from 1.53 to 1.70) and effect of price on how much they smoke (OR increased from 2.28 to 2.90), but neither reached statistical significance. The education term did not approach significance for any price sensitivity item among the NDND smokers. For FDND smokers, the education covariate did not influence any of the odds ratios for ethnicity. The education term significantly predicted a lower likelihood of price influencing which brand was purchased for FDND smokers (OR = .76 per year of education, \(p = .004\)). These analyses should be considered exploratory given the limited sample size and the number of variables already considered in the primary analyses.

**DISCUSSION**

This study examined perceived price sensitivity by daily smoking status and ethnicity among Hispanic and non-Hispanic White respondents from the 2008 CTS. Consistent with previous investigations (Coggins, Murrelle, Carchman, & Heidbreder, 2009; Gilpin et al., 1997; Hassmiller, Warner, Mendez, Levy, & Romano, 2003; Husten, McCarty, Giovino, Chrismon, & Zhu, 1998; Trinidad et al., 2009; Zhu et al., 2007), Hispanic smokers were less likely to be daily smokers and more likely to be never daily smokers than were non-Hispanic Whites. Overall, differences in price sensitivity responses were found by ethnic group when controlling for age, gender, and cigarette frequency. Comparisons across ethnic groups indicated that Hispanic smokers, in general, report more price sensitivity than non-Hispanic White smokers. When examined within ethnicity, price sensitivity showed more variability by smoking status.
for non-Hispanic White than Hispanic smokers. Overall, these findings provide novel information regarding the relationship of perceived price sensitivity to smoking status and ethnicity. Results suggest that increased pricing of cigarettes may be more influential for controlling tobacco use in minorities and also has an effect among non-daily as well as daily smokers.

Few previous studies have examined differential price sensitivity by daily versus non-daily smokers, with one study finding differences by age and gender subgroups (Au, 2009). In this study, no price sensitivity differences emerged for daily versus non-daily smokers after controlling for smoking quantity. As in other studies, greater perceived price sensitivity was associated with smoking quantity, reflecting the greater cigarette-related expenses borne by heavier smokers. Results for the Hispanic sample are thus similar to findings from a study conducted in Mexico (Saenz-de-Miera et al., 2010), which reported greater increases in smoking behavior for heavier smokers. The similarity in these results for U.S. Hispanic and Mexican smokers suggest that responses regarding perceived price sensitivity may translate to changes in behavior.

A unique aspect of this study was comparison of perceived price sensitivity across ethnicity within the separate categories of daily, NDND and FDND smokers, controlling for smoking frequency. Hispanic daily smokers were more likely to report they would switch cigarette brand and reduce smoking rate compared with non-Hispanic White smokers, indicating greater perceived price sensitivity. A significant ethnic difference was observed for FDND smokers, indicating that for Hispanic smokers within this category pricing may reduce how much they smoke. Similarly, Hispanic NDND smokers were significantly more likely than non-Hispanic Whites to report that price would influence their desire to quit smoking. It may be that NDND smoking represents a more stable smoking pattern among Hispanics (Reitzel et al., 2009), whereas for non-Hispanic Whites this category may be more representative of individuals who smoke more sporadically (Levy et al., 2009) and thus may be less sensitive to cigarette pricing. Overall, Hispanic smokers reported more price sensitivity across smoking status categories.

Overall, findings of greater perceived price sensitivity for Hispanic compared with non-Hispanic White smokers may reflect differences in SES. Specifically, Hispanic smokers in California may have more limited economic means than non-Hispanic Whites (Census, 2000), resulting in greater price sensitivity regardless of smoking quantity and frequency. Our exploratory analyses adjusting for education attenuated the effect of ethnicity for most items, suggesting that differences in perceived price sensitivity between non-Hispanic Whites and Hispanics are explained to some degree by differences in education or associated variables. These results must however be interpreted cautiously given the small sample sizes within the subcategories of smoking status by ethnicity. Additionally, as suggested above, the greater price sensitivity along with fewer differences between daily and non-daily smoking for Hispanics may also be influenced by more consistent patterns of cigarette use by NDND smokers. Although the composition of smoking status groups across ethnicity also differed by age and gender, these variables as well as cigarette frequency were controlled for in the analyses. These findings have implications for tobacco control policy, suggesting that cigarette price increases may effectively reduce smoking among Hispanic non-daily smokers.

This study is limited by a relatively small sample size, particularly when comparing subgroups of non-daily smokers. The limited size of these subgroups precluded more detailed analyses to evaluate, for example, the potential influence of age composition or the inclusion of ethnicity by smoking status interaction terms in the models. However, our survey is considered one of the larger state-wide surveys and therefore allowed us to carry out subgroup analyses of non-daily smokers. The data were weighted to reflect the California population; however, generalizability to smokers in other states with varying tobacco control efforts and tax rates is unknown. Further, we only had a limited ability to assess the role of income or SES on price sensitivity. Finally, the price sensitivity items in the CTS reflect perceived, rather than actual, price sensitivity and results should be interpreted accordingly.

In summary, this study is the first that we are aware of to examine price sensitivity by smoking frequency status and ethnicity. Results indicate greater perceived price sensitivity among Hispanic smokers and similar sensitivity to the effect of pricing on desire to quit among Hispanics regardless of daily or non-daily smoking status. These findings indicate that cigarette pricing policies may have influence on smoking behavior of non-daily as well as daily smokers. Further, pricing increases may be differentially influential for Hispanic non-daily compared with non-Hispanic White non-daily smokers. As such these findings provide support for implementation of further cigarette price increases as a policy approach to tobacco control in California.

FUNDING

Data collection for this study was supported through contract 08-85653 from the California Department of Public Health (PI: Al-Delaimy).

Table 4. Perceived Price Sensitivity by Ethnicity for NDND and FDND Smokers

<table>
<thead>
<tr>
<th>Item</th>
<th>NDND smokers</th>
<th></th>
<th>FDND smokers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR*</td>
<td>95% CI</td>
<td>p value</td>
<td>OR*</td>
</tr>
<tr>
<td>Money you spend</td>
<td>1.53</td>
<td>0.63–3.69</td>
<td>.343</td>
<td>2.78</td>
</tr>
<tr>
<td>How much you smoke</td>
<td>2.28</td>
<td>1.03–5.03</td>
<td>.042</td>
<td>2.61</td>
</tr>
<tr>
<td>Where you buy</td>
<td>1.46</td>
<td>0.58–3.67</td>
<td>.419</td>
<td>1.49</td>
</tr>
<tr>
<td>Which brand you buy</td>
<td>3.14</td>
<td>1.03–9.59</td>
<td>.044</td>
<td>2.21</td>
</tr>
<tr>
<td>Your desire to quit</td>
<td>4.81</td>
<td>2.35–9.83</td>
<td>&lt;.001</td>
<td>2.08</td>
</tr>
</tbody>
</table>

Note. Reference group = White. FDND = former daily non-daily; NDND = never daily non-daily.

*OR = odds ratio after controlling for age, gender, cigarette quantity (log transformed number of cigarettes smoked per month), and age by gender interaction.
Perceived price sensitivity by ethnicity and smoking frequency

DECLARATION OF INTERESTS
None declared.

REFERENCES


