# Cigarette Price-Minimization Strategies by U.S. Smokers 

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#### Abstract

Background-Smokers may react to cigarette excise tax increases by engaging in priceminimization strategies (i.e., finding ways to reduce the cost of cigarette smoking) rather than by quitting or reducing their cigarette use, thereby reducing the public health benefits of such tax increases.

Purpose-To evaluate the state and national prevalence of five common cigarette priceminimization strategies and the size of price reductions obtained from these strategies.

Methods-Using data from the 2009-2010 National Adult Tobacco Survey, the prevalence of five common price-minimization strategies by type of strategy and by smoker's cigarette consumption level were estimated. The price reductions associated with these price-minimization strategies also were evaluated. Analyses took place in November 2012.

Results—Approximately $55.4 \%$ of U.S. adult smokers used at least one of five priceminimization strategies in the previous year, with an average reduction of $\$ 1.27$ per pack ( $22.0 \%$ ). Results varied widely by state.

Conclusions-Cigarette price-minimization strategies are practiced widely among current smokers, and resulting price reductions are relatively large. Policies that decrease opportunities to effectively apply cigarette price-minimization strategies would increase the public health gains of cigarette excise tax increases.


## Background

Increases in cigarette prices have been shown to prevent smoking initiation, increase rates of smoking cessation, and reduce the overall consumption of cigarettes. ${ }^{1-4}$ The most effective way for governments to increase cigarette prices is to increase excise taxes. ${ }^{1-3}$ However, rather than quitting or reducing their cigarette use, some smokers may react by using priceminimization strategies (i.e., finding ways to save money on cigarettes), thereby reducing the public health impact of the increases. ${ }^{5}$

[^0]Strategies smokers use to minimize their cigarette costs include crossing borders to purchase cigarettes in states with lower excise taxes; purchasing lower-priced cigarettes from retailers on the Internet or on Indian reservations; purchasing cigarettes on the black market; rolling their own cigarettes; switching to a less expensive or generic brand; using price-related discounts such as coupons or multi-pack offers; and purchasing cartons instead of packs. ${ }^{5-14}$

Using the 2009-2010 National Adult Tobacco Survey (NATS), the main purpose of the current analysis is to evaluate the prevalence of adult smokers who used one or more of five common price-minimization strategies in the previous year, and per-pack price reductions associated with use of these strategies at both the national and state level. The national prevalence also is stratified by type of strategies and by smokers' cigarette consumption level. Although estimates of the extent of use of price-minimization strategies have been published for selected states, ${ }^{8,11-13,15}$ this is the first study, to the authors' knowledge, to provide these estimates for all states.

## Methods

Data used for this analysis are restricted to 14,891 current smokers who participated in the NATS from October 2009 through June 2010 and who reported values to questions related to cigarette consumption and price paid. The NATS, a stratified landline and cell phonebased survey of tobacco use among non-institutionalized U.S. adults (aged $\geq 18$ years) conducted by the CDC, was designed to assess the prevalence of and factors related to tobacco use at both the national and state levels.

The analyses were derived from smokers' responses to questions related to the prices they paid for cigarettes and whether they had engaged in the following five price-minimization activities: (1) made their most recent cigarette purchase by the carton rather than by the pack; (2) took advantage of a marketing promotion such as a coupon or a multi-pack offer to make their most recent purchase; (3) purchased cigarettes over the Internet during the previous year; (4) purchased cigarettes on an Indian reservation during the previous year; or (5) mostly smoked generic cigarettes during the previous 30 days. Smokers who provided positive responses to any of these five questions were categorized as having used priceminimization strategies in the previous year.

To evaluate price reductions associated with the use of these strategies, prices were constructed using average per-pack prices paid; these values were consumption-weighted by whether or not smokers used any price-minimization strategies in the previous year. In the NATS, smokers were asked to report price in dollars (after discounts and coupons) for the last pack or carton they purchased. Price per carton was converted to price per pack by dividing the carton price by 10 . The cigarette consumption weight was used to obtain the average price per pack, because evidence from selected states shows that the use of priceminimization strategies was related closely to smoker's cigarette consumption, meaning heavy or more-addicted smokers were more likely to use these strategies. ${ }^{11-15}$ In other words, self-reported cigarette prices in the NATS may differ depending on smoker's cigarette consumption.

To estimate consumption-weighted average prices per pack for smokers who did and did not use price-minimization strategies, the total monthly cigarette consumption and total monthly cigarette expenditure were obtained for the two groups. In each group, the monthly consumption for each smoker was estimated by multiplying the number of smoking days in the past 30 days by the number of cigarettes consumed on smoking days. The monthly expenditure for each smoker was estimated by multiplying the price paid per last pack with that smoker's monthly cigarette consumption. The total monthly cigarette consumption and total monthly cigarette expenditure for each of the two groups were then obtained by summing individual consumptions and expenditures across all smokers in that group. Finally, the consumption-weighted average prices per pack were estimated by dividing the total monthly expenditure by the total monthly consumption within each group.

Analyses were performed in November 2011 using Stata, version 12. Appendix A (available online at www.ajpmonline.org) provides additional details about the data collection; the sensitivity analyses (performed to assess the potential impact of missing values on Indian reservation purchases); and the significance of cost reductions per pack associated with price-minimization strategies.

## Results

At least $55.4 \%$ of U.S. adult smokers used one or more price-minimization strategies in the previous year (Table 1). Among the five price-minimization strategies, the most frequently used were purchasing generic brands and purchasing cigarettes by the carton ( $25.0 \%$ and $24.3 \%$, respectively). Making use of coupons or other price-related promotions (19.8\%) were somewhat less common. More than $7.0 \%$ had purchased cigarettes from Indian reservations in the previous year, and $1.2 \%$ had purchased cigarettes online.

Compared to those who smoked <5 cigarettes per smoking day, heavy smokers (>15 cigarettes per smoking day) were much more likely to use price-minimization strategies ( $31.5 \%$ vs $8.6 \%$ ). A similar pattern held for each of the strategies. Chi square tests suggest that, compared to smokers who did not use any strategies, heavy smokers were more likely to use these price minimization strategies ( $p<0.05$ ).

The average price per pack paid by smokers who did not use any of these strategies in the previous year was $\$ 5.76$ (Table 2). This value is similar to the 2009 national cigarette salesweighted average per-pack price for premium cigarettes (\$5.68) in the Tax Burden on Tobacco (TBOT). ${ }^{16}$ In contrast, the estimated average price per pack paid by smokers who used at least one price-minimization strategy was $\$ 4.49$, representing a reduction of $\$ 1.27$ per pack or $22.0 \%$. The state prevalence of using any price-minimization strategy ranged from $27.4 \%$ in Washington DC to $73.2 \%$ in Wyoming. After Wyoming, the states with the next-highest prevalence were North Dakota (72.2\%); Washington State and Iowa (both $70.9 \%$ ); and West Virginia ( $70.7 \%$ ); after Washington DC, the states with the next-lowest prevalence were Connecticut (31.6\%); New Jersey (38.9\%); Massachusetts (40.2\%); and Maryland (41.4\%).

The average per-pack price reductions associated with these strategies ranged from $\$ 0.07$ in Wyoming to $\$ 2.66$ in New York. The states with the next-highest average reductions were Vermont (\$1.80); Rhode Island (\$1.74); Wisconsin (\$1.67); and Illinois (\$1.52). The states with the next-lowest average reductions were Wyoming (\$0.07); Minnesota (\$0.25); Washington, DC (\$0.26); Oregon (\$0.35); and New Hampshire (\$0.44).

## Discussion

At least $55.4 \%$ of U.S. adult smokers engaged in legal activities that reduced the price they paid for cigarettes, and smokers who engaged in these activities paid a substantially lower price than those who did not. Consistent with evidence on the impacts of price-minimization strategies on the pass-through rates of cigarette excise taxes, ${ }^{17-19}$ these results suggest that rather than quitting in reaction to a cigarette excise tax increase, price-sensitive smokers may have low-priced alternatives that allow them to continue to purchase cigarettes within their budget. These behaviors may decrease the health benefit of cigarette excise tax increases.

The analysis has some limitations. First, because of a delay in the survey process (see Appendix A, available online at www.ajpmonline.org), the survey question on purchasing cigarettes from Indian reservations was not asked of $18.4 \%$ of NATS smokers. However, the sensitivity analysis suggests that the main conclusions are independent of methods used to treat these missing values. Second, the NATS does not collect information regarding purchase of cigarettes from another state or country or on the black market, or whether respondents had used commercial roll-your-own machines. Other studies have discussed the impact of the federal tax disparity between roll-your-own and pipe tobacco and the impact of state tax avoidance. ${ }^{5,6,20,21}$ Also, the NATS questions on price-minimization strategies are based on different time frames. As a result of the above two data limitations, the prevalence of price-minimization strategies may be underestimated.

The inconsistent time frame also may affect the estimation of consumption-weighted average prices, for which the assumption was made that price minimization practiced at the most recent purchase had been applied to all purchases by that smoker in the previous year. Finally, because this was the first NATS, this analysis could not identify changes in purchase patterns in reaction to a tax increase. Other studies have documented smokers seeking less-expensive cigarettes in reaction to a price increase. ${ }^{6,8,10,21,22}$ For example, in reaction to the 2009 federal excise tax increase, Internet searches for low-priced cigarettes increased. ${ }^{22}$

Cigarette price-minimization strategies are practiced widely, and resulting cost reductions are quite large. More research is needed to identify policies that will be effective in decreasing such cost-reduction opportunities, such as enacting minimum per-pack price laws, prohibiting discounts, or expanding state-level negotiations with Indian reservations to collect taxes from non-Indian purchases. ${ }^{23-25}$ The Federal Prevent All Cigarette Trafficking (PACT) Act restricts the delivery of cigarettes through the mail; the act was implemented in 2010 and supports the decrease of cigarette cost-reduction opportunities. ${ }^{26}$

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## Appendix: Supplementary Data

Supplementary data associated with this article can be found, in the online version, at http:// dx.doi.org/10.1016/j.amepre.2013.01.019.

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Table 1
The prevalence of use of various price-minimization strategies among U.S. adult smokers
Note: Boldface indicates significance. (1) All estimates were adjusted with the use of sampling weights. (2) Respondents who failed to report the brand of cigarettes they smoked were classified as having used a price-minimization strategy, because the average price that they reported paying was less than that reported by respondents who purchased discounted brands. (3) It was assumed that respondents purchases or coupon use were excluded from this analysis. (5) The sums of the prevalence of individual price-minimization strategies may be greater than the values in the "any strategy" column, because of the possibility of using multiple strategies.
*For each strategy shown when compared with no strategy, the distributions of cigarettes consumed per smoking day were significantly different ( $p<0.05$ ).

## Table 2

The prevalence of price-minimization strategies used by smokers, and average price reductions by state

| State | Used any strategy, \% (95\% CI) | Average price per pack paid, with no strategy, \$ | Average price per pack paid, with strategy, \$ | Average price reduction with strategy, \$ (\%) |
| :---: | :---: | :---: | :---: | :---: |
| U.S. | 55.4 (53.8, 57.0) | 5.76 | 4.49 | 1.27 (22.0) |
| New York | 49.8 (41.8, 57.9) | 7.98 | 5.32 | 2.66 (33.3) |
| Vermont | 53.3 (44.0, 62.6) | 7.09 | 5.29 | 1.80 (25.4) |
| Rhode Island | 46.5 (37.1, 55.9) | 7.94 | 6.20 | 1.74 (21.9) |
| Wisconsin | 53.9 (43.1, 64.7) | 6.80 | 5.13 | 1.67 (24.6) |
| Illinois | 43.7 (35.5, 51.8) | 6.21 | 4.69 | 1.52 (24.5) |
| Massachusetts | 40.2 (27.7, 52.7) | 7.88 | 6.37 | 1.51 (19.2) |
| New Mexico | 70.5 (57.7, 83.4) | 5.34 | 3.92 | 1.42 (26.6) |
| Missouri | 67.9 (57.0, 78.8) | 4.52 | 3.14 | 1.38 (30.5) |
| South Dakota | 58.6 (48.7, 68.6) | 6.18 | 4.83 | 1.35 (21.8) |
| Utah | 42.9 (28.7, 57.1) | 5.57 | 4.25 | 1.32 (23.7) |
| Iowa | 70.9 (62.3, 79.6) | 5.59 | 4.28 | 1.31 (23.4) |
| Alaska | 44.2 (35.5, 53.0) | 8.10 | 6.82 | 1.28 (15.8) |
| New Jersey | 38.9 (33.1, 44.7) | 7.39 | 6.22 | 1.17 (15.8) |
| Maryland | 41.4 (28.9, 54.0) | 6.01 | 4.85 | 1.16 (19.3) |
| Tennessee | 64.0 (54.3, 73.7) | 4.93 | 3.81 | 1.12 (22.7) |
| North Carolina | 60.7 (52.9, 68.6) | 4.76 | 3.65 | 1.11 (23.3) |
| Washington state | 70.9 (62.7, 79.0) | 6.29 | 5.19 | 1.10 (17.5) |
| Montana | 61.5 (50.6, 72.4) | 5.67 | 4.60 | 1.07 (18.9) |
| Oklahoma | 69.2 (64.8, 73.6) | 5.11 | 4.04 | 1.07 (20.9) |
| Nevada | 64.6 (55.9, 73.4) | 5.14 | 4.08 | 1.06 (20.6) |
| Virginia | 51.4 (42.4, 60.3) | 4.65 | 3.59 | 1.06 (22.8) |
| Colorado | 65.6 (55.3, 75.8) | 5.20 | 4.15 | 1.05 (20.2) |
| California | 51.4 (43.2, 59.6) | 5.59 | 4.55 | 1.04 (18.6) |
| Arkansas | 63.7 (56.3, 71.1) | 5.03 | 4.02 | 1.01 (20.1) |
| Texas | 55.5 (48.0, 62.9) | 5.69 | 4.68 | 1.01 (17.8) |
| Nebraska | 57.0 (46.5, 67.6) | 5.05 | 4.07 | 0.98 (19.4) |
| Arizona | 64.2 (50.7, 77.7) | 6.18 | 5.22 | 0.96 (15.5) |
| Kansas | 58.6 (48.1, 69.1) | 4.97 | 4.01 | 0.96 (19.3) |
| Hawaii | 67.3 (57.4, 77.2) | 7.19 | 6.25 | 0.94 (13.1) |
| Pennsylvania | 49.8 (44.0, 55.7) | 5.78 | 4.88 | 0.90 (15.6) |
| Connecticut | 31.6 (22.1, 41.1) | 7.75 | 6.86 | 0.89 (11.5) |
| Kentucky | 65.4 (56.0, 74.7) | 4.51 | 3.62 | 0.89 (19.7) |
| Florida | 67.9 (60.3, 75.4) | 5.40 | 4.55 | 0.85 (15.7) |
| Louisiana | 53.4 (48.1, 58.6) | 4.77 | 3.92 | 0.85 (17.8) |
| Ohio | 49.4 (42.9, 56.0) | 5.35 | 4.51 | 0.84 (15.7) |


| State | Used any strategy, \% (95\% <br> CI) | Average price per pack <br> paid, with no strategy, $\mathbf{\$}$ | Average price per pack <br> paid, with strategy, $\mathbf{\$}$ | Average price reduction <br> with strategy, $\mathbf{( \% )}$ |
| :--- | :---: | :--- | :---: | :---: |
| South Carolina | $57.8(51.9,63.7)$ | 4.21 | 3.39 | $0.82(19.5)$ |
| Indiana | $49.4(40.9,57.9)$ | 4.96 | 4.16 | $0.80(16.1)$ |
| West Virginia | $70.7(62.9,78.4)$ | 4.34 | 3.55 | $0.79(18.2)$ |
| Idaho | $65.5(53.6,77.4)$ | 4.66 | 3.89 | $0.77(16.5)$ |
| Mississippi | $51.2(40.8,61.7)$ | 4.63 | 3.88 | $0.75(16.2)$ |
| Maine | $51.3(42.1,60.6)$ | 6.30 | 5.64 | $0.66(10.5)$ |
| North Dakota | $72.2(63.7,80.7)$ | 4.38 | $0.64(14.6)$ |  |
| Michigan | $61.2(51.1,71.2)$ | 5.96 | $0.62(10.4)$ |  |
| Delaware | $42.1(33.2,51.1)$ | 5.48 | $0.60(10.9)$ |  |
| Georgia | $50.5(43.7,57.4)$ | 4.28 | 3.88 | $0.51(11.9)$ |
| Alabama | $62.4(53.6,71.2)$ | 4.38 | 0.77 | 0.91 |
| New Hampshire | $63.0(53.8,72.1)$ | 5.87 | 5.43 | $0.44(7.5)$ |
| Oregon | $55.7(44.5,67.0)$ | 4.98 | 4.63 | $0.35(7.0)$ |
| Washington DC | $27.4(19.2,35.7)$ | 6.00 | 5.74 | $0.26(4.3)$ |
| Minnesota | $66.3(56.4,76.3)$ | 5.11 | 4.41 | $0.25(4.9)$ |
| Wyoming | $73.2(64.1,82.4)$ | 4.48 | $0.07(1.6)$ |  |

Note: States are listed in order of the average price reductions per pack of cigarettes among residents who used at least one price-minimization strategy (i.e., cartons, marketing promotions, Internet, Indian reservation, generic brands). (1) All estimates were adjusted with the use of sampling weights. The consumption weight was based on respondent reports of the number of cigarettes they smoked per day and the number of days they smoked in the previous 30 days. (2) Respondents who failed to report the brand of cigarettes they smoked were classified as having used a priceminimization strategy because the average price per pack that they reported paying was less than that reported by respondents who purchased discounted brands. (3) It was assumed that respondents who were not asked about the survey question of whether they had purchased cigarettes on an Indian reservation had not made such a purchase. (4) Respondents with missing information about Internet purchases or coupon use were excluded from this analysis.


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