

Cigarette Price-Minimization Strategies in the U.S.

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Appendix A

The 2009–2010 National Adult Tobacco Survey Methodology

The 2009–2010 National Adult Tobacco Survey (NATS) target population was non-institutionalized adults aged ≥ 18 years residing in the 50 U.S. states and Washington D.C. The sample was designed to yield representative national and state-level data. Each state was divided into at least three strata: listed landline, unlisted landline, and cell phone. The listed stratum consisted of landline telephone numbers in residential directories or in other source databases; the unlisted stratum consisted of landline telephone numbers that were not listed as a residential number in any source database. Some states also had additional landline strata based on counties, or county equivalents. For the landline component, each state was allocated an equal target sample size ($n=1863$) to ensure adequate precision for state-level estimates. For the cell phone component, each state was allocated a sample size in proportion to its population. Four states independently added to their samples: Louisiana, New Jersey, North Dakota, and Oklahoma.

Respondent selection varied by phone type. For landline numbers, one adult was randomly selected from each eligible household. In contrast, adults who were cell phone-only users were selected through screening of a sample of cell phone numbers. In total, 118,581 NATS interviews were completed (landline $n=110,634$; cell phone $n=7947$) between October 2009 and February 2010, with follow-up through June 2010. The national Council of American Survey and Research Organizations (CASRO) response rate, which is defined as the number of completed interviews divided by the number of eligible respondents in the sample, was 37.6% (landline=40.4%, cell phone=24.9%). The national cooperation rate, which is defined as the number of completed interviews divided by the number of eligible respondents who were successfully reached by an interviewer, was 62.3% (landline=61.9%, cell phone=68.7%). State-specific CASRO response rates ranged from 28.2% in New Jersey to 49.3% in Vermont (median=37.9%); cooperation rates ranged from 52.9% in Louisiana to 72.4% in Vermont (median=62.9%). Although the 2009–2010 NATS has a relatively low response rate (37.6%), appropriate weighting procedures were applied to compensate for the bias created by survey nonresponse. The national estimate of current cigarette smoking rate (19.5%) from the 2009–2010 NATS is identical to the one (19.4%) from the 2010 National Health Interview Survey.

Landline data were weighted according to the selection probability of the telephone number, the number of adults in the household, and the number of landline telephone numbers in the household. Cell phone data were weighted only according to the selection probability of the cell phone number, because a cell phone was assumed to be used only by the person who answered it. After adjustment for nonresponse, the SUDAAN software procedure WTADJUST was used to apply a model-based approach to post-stratify the weights to state-level population totals by age, gender, race, marital status, education, and phone type (cell phone-only users and all others).

For states with a small number of cell phone respondents, the use of both landline and cell phone data resulted in a large unequal weighting effect and large estimated variances and small effective sample sizes. As a result, national and state estimates were calculated using two separate weights. For the national weight, both cell phone and landline sample members were included; however, for the state weight, cell phone sample members were included only for states with a cell phone sample of at least 200 ($n=12$: California, Florida, Georgia, Illinois, Louisiana, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Oklahoma, and Texas).

Study Methodology

In the current analysis, nonsmokers were excluded (86.1% of the sample, $n=102,039$), as were smokers who did not provide the price paid for the last pack or carton of cigarettes ($n=1,243$) or failed to provide a price that was within a reasonable range ($n=30$). Also excluded were respondents who did not report whether they used a special promotion at last purchase or whether they had purchased cigarettes online during the past year ($n=37$). Finally, observations with data missing on the number of cigarettes smoked daily ($n=323$) or with 0 cigarettes smoked daily ($n=18$) were excluded. The final sample size was 14,891.

The following questions were used to identify the self-reported price per pack. Smokers in the NATS were asked the following question: *The last time you bought cigarettes for yourself, did you buy them by the pack or by the carton?* Depending on their responses, each of them was asked: *What price did you pay for the last pack of cigarettes you bought after discounts or coupons?* or *What price did you pay for the last carton of cigarettes you bought after discounts or coupons?* In the analysis, self-reported price per carton was converted into price per pack by dividing prices per carton by 10.

The following questions were used to identify price-minimization strategies. If individuals reported buying cigarettes for themselves over the past month, they were asked: *During the past 30 days, that is, since [date], what brand of cigarettes did you buy most often?* Interviewers could check one of 10 regular brands, six discount brands, an "other" brand option, and an option indicating no preferred brand. Reported prices for smokers who were missing information on their cigarette brand and those who were classified as using "other" cigarette brands were lower than reported prices paid for discount brands. All three (discount, other, and missing) are classified as using the generic brand price-minimization strategy.

Smokers were asked: *The last time you bought cigarettes for yourself, did you buy them by the pack or by the carton?* If individuals reported either option, they were asked the price last paid for their usual quantity purchased. Smokers were also asked: (1) *The last time you bought cigarettes, did you take advantage of coupons, rebates, buy 1 get 1 free, 2 for 1, or any other special promotions for cigarettes?*; (2) *In the past 12 months, that is, since [date], have you bought cigarettes over the Internet?*; and (3) *In the past 12 months, that is, since [date], have you bought cigarettes on an Indian reservation?*

Sensitivity Analysis

Due to an approval delay in the first 2 months of data collection, only approximately 20% of respondents were asked if purchases had been made on an Indian reservation anytime over the

past year. In subsequent months, this question was asked of more than 90% of respondents. In the full sample, total missing responses for this question were 18.4%. By state, missing responses ranged from 5.2% to 31.7%. Sensitivity analyses that compared dropping the observations rather than treating observations with missing data on this variable as non-Indian reservation purchases showed no bias. The national price for those not practicing a price-minimization strategy would only be 0.7% less if these observations were excluded instead of being treated as non-Indian reservation purchases. Only two states, South Dakota and Tennessee, showed a price difference for this measure of greater than 5% compared to reported prices (-5.1% and 5.9%, respectively).

Detecting and interpreting significant differences for average per-pack prices is challenging due to the use of monthly cigarette consumption of NATS respondents as weights, as well as to small sample sizes in some states. In an alternative method of estimating the size of price reductions, national and state estimates were computed by linearly regressing self-reported price per pack on a dichotomous indicator of the presence of any price-minimization strategy and monthly cigarette consumption (for consumption weighting purposes). The “any price-minimization strategy” parameter was always negative in state-level regressions; nationally and in 45 states, per-pack prices were significantly lower ($p < 0.05$) when any cigarette price-minimization strategy was practiced. Moreover, the estimated price reductions from this alternative approach are comparable to those reported in Table 1 (in main text). For example, the national average price reduction associated with using any price-minimization strategy was found to be \$1.10, and the New York price reduction was found to be \$2.44; these amounts are similar to the estimates of \$1.27 and \$2.66 found using the earlier approach.