

# The Impact of Cigarette Pack Design, Descriptors, and Warning Labels on Risk Perception in the U.S.

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**Background:** In the U.S., limited evidence exists on the impact of colors and brand imagery used in cigarette pack design.

**Purpose:** This study examined the impact of pack design, product descriptors, and health warnings on risk perception and brand appeal.

**Methods:** A cross-sectional mall-intercept study was conducted with 197 adult smokers and 200 nonsmokers in Buffalo NY from June to July 2009 (data analysis from July 2009 to December 2010). Participants were shown 12 sets of packs randomly; each set varied by a particular design feature (color, descriptor) or warning label style (text versus graphic, size, attribution, message framing). Packs were rated on criteria including risk perceptions, quit motivation, and purchase interest.

**Results:** Participants selected larger, pictorial, and loss-framed warning labels as more likely to attract attention, encourage thoughts about health risks, motivate quitting, and be most effective. Participants were more likely to select packs with lighter color shading and descriptors such as *light*, *silver*, and *smooth* as delivering less tar, smoother taste, and lower health risk, compared to darker-shaded or *full-flavor* packs. Additionally, participants were more likely to select the *branded* compared to *plain* white pack when asked which delivered the most tar, smoothest taste, was more attractive, appealed to youth aged <18 years, and contained cigarettes of better quality.

**Conclusions:** The findings support larger, graphic health warnings that convey loss-framed messages as most effective in communicating health risks to U.S. adults. The results also indicate that color and product descriptors are associated with false beliefs about risks. Plain packaging may reduce many of the erroneous misperceptions of risk communicated through pack design features.

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## Introduction

Cigarette packaging serves as a critical marketing tool for the tobacco industry.<sup>1–4</sup> In addition to promoting brand appeal and linking to other forms of marketing, packaging can also provide reassurance to health concerned smokers. The “Family Smoking Prevention and Tobacco Control Act” (FSPTCA), passed in 2009, gave the U.S. Food and Drug Administration

(FDA) authority to regulate tobacco products.<sup>5</sup> New regulation prohibits tobacco companies from manufacturing cigarette packs labeled with terms such as “light,” “mild,” or “low” because these descriptors are misleading.<sup>5,6</sup> However, there is growing evidence that other elements of package design also have the potential to mislead smokers. For example, consumers in the United Kingdom (UK) and Canada perceive cigarettes in lighter-color packs as less harmful and easier to quit compared to cigarettes in darker packages.<sup>3,7</sup>

These studies also found that smokers in the UK and Canada associate “descriptors” in the name of brands, such as “smooth,” with reduced harm. In the U.S., although there is considerable evidence that brands labeled as “light” and “mild” are perceived as less harmful,<sup>8–12</sup> there is relatively little evidence on perceptions of other descriptors or the impact of colors and brand imagery. Given that several tobacco manufacturers in the U.S. have altered their packs to comply

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with the ban on “light” and “mild” descriptors, it is imperative to understand how the revised pack designs will be perceived by consumers.

Like the tobacco industry, governments are also using the cigarette package to communicate directly to consumers. In response to the WHO FCTC treaty,<sup>13,14</sup> more than two dozen countries have implemented prominent health warnings on the front and back of packages that include graphic pictures to communicate risk. Previous research suggests<sup>3,7,13,15–18</sup> that the use of pictures and increases in the size of health warnings enhances their effectiveness with respect to perceptions of risk and cessation-related behaviors. In the U.S., the four text-based warnings that rotate and are printed on the side panel of a cigarette pack have not changed since 1985. The FSPTCA specifies that nine warning statements appear on cigarette packs, with an increase in warning label size to 50% of the pack face and the inclusion of graphic images alongside the text, within 39 months of enactment.<sup>5</sup>

The current study sought to examine the impact of cigarette pack design and pictorial health warnings among U.S. adults. Based on the findings from studies<sup>3,7,13,16,19,20</sup> conducted in Canada, Australia, and the UK, it was hypothesized that larger, graphic warning labels would be rated as more effective in deterring smoking as compared to smaller text-based warnings in samples of U.S. adult smokers and nonsmokers. It was also hypothesized that both smoker and nonsmoker perceptions about the strength of a product and its health risks would be influenced by package color and descriptors.

## Methods

### Study Population and Methods

The present study population included 197 adult smokers and 200 adult nonsmokers recruited through a cross-sectional mall-intercept survey conducted in Buffalo NY between June and July 2009; data were analyzed from July 2009 to December 2010. The current study was approved by the Roswell Park Cancer Institute IRB to safeguard the rights of all participants. Participants were aged  $\geq 18$  years who were currently U.S. residents and were able to read and write in English. Eligible participants who consented were asked a series of questions about their tobacco use behaviors, knowledge and beliefs about smoking, and demographic characteristics. After completing the baseline survey, participants were asked to view a series of cigarette packages, one set at a time. Participants were allowed to pick up and review the packs if they wanted and then were asked four to eight questions about each set. Participants were asked to review a total of 12 sets of cigarette packages presented to them in randomized order. After completing all 12 pack selections, participants were compensated with a \$10 gift card to use in the mall.

### Cigarette Packages

Cigarette packages were designed specifically for the present study with an unfamiliar brand name. The rationale for creating new packs was twofold: (1) it allowed variation in individual elements of the design while keeping all other elements constant; and (2) it avoided using existing brand names of cigarettes sold in the U.S. market today, which could influence responses by participants who would feel a sense of brand loyalty when viewing the study packs. The packs created for the current study were printed on high-quality white cardstock paper, folded in the same manner as a typical pack of cigarettes sold in the U.S.

Figure 1 shows the 12 sets of cigarette packs tested in the present study. Each set of packs presented to participants was identical except for the single characteristic that was manipulated. Four specific features of the health warning label were varied in the study: two pairs presented a health warning in graphic versus text format; two pairs presented a health warning in gain versus loss-framing text style; one set of three packs included labels that varied by size of graphic warning label (30% on front of all packs; 30% vs 50% vs 100% on back of packs); and one set of three packs included labels that varied by source attribution of the health warning message (*Surgeon General* vs *FDA* vs none). The graphic versus text health warning messages were formatted to cover 30% of the pack face, front and back, using text included in the new FSPTCA law, with a graphic that is currently used to express a similar message on other health warning labels around the world.

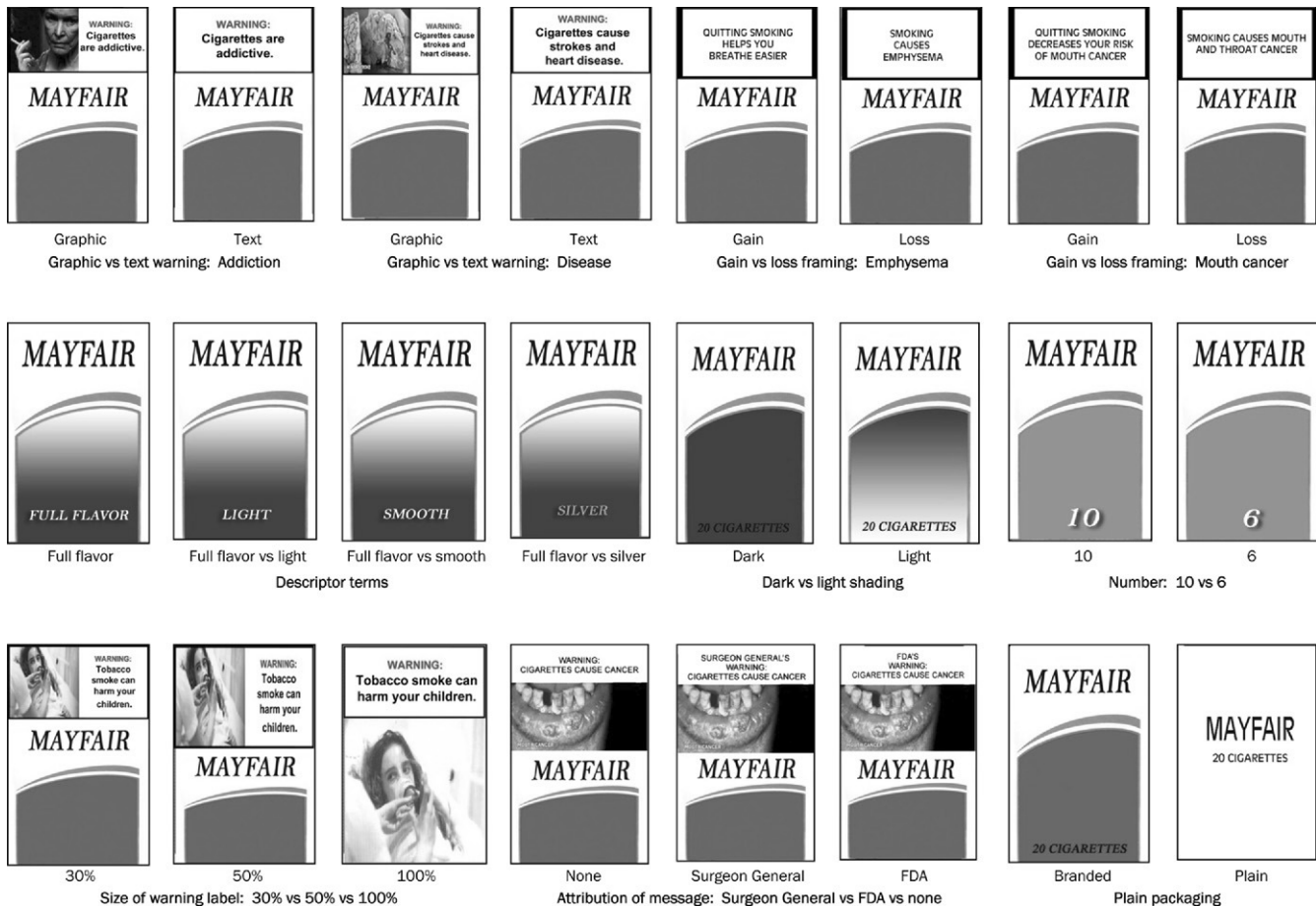
Six pack design characteristics were manipulated in the current study: *full flavor* versus *light*; *full flavor* versus *smooth*; *full flavor* versus *silver*; 10 versus 6; shading of pack color (*dark blue* versus *light blue*); and a plain packaging version with one *branded* pack versus a *plain* pack with no color or brand imagery. Each package displayed the same health warning—a current U.S. health warning that is text-based and printed on the side of the pack.

### Pack Selections

Specific questions asked of participants when making pack selections are available in Appendix A (available online at [www.ajpm-online.net](http://www.ajpm-online.net)). Participants were encouraged to select one of the packages in the set as a response for each question; all other responses provided were recorded and considered missing values for analyses.

### Statistical Analysis

All analyses were conducted using SPSS statistical analysis software, version 14.0. Analysis of the data was conducted from July 2009 through December 2010. Chi-square statistics were used to test for significant differences in pack selections, as well as differences in selections between smokers and nonsmokers and smokers of “light/mild” versus full-flavor cigarettes. Type of cigarette smoked (“light/mild” versus full-flavor) was determined by current brand and type of cigarette reportedly smoked by participant (descriptor term provided by participant, including “light,” “ultra light,” “mild,” or “medium”); occasional smokers who did not provide a current brand and type of cigarette smoked were assumed to smoke full-flavor cigarette brands ( $n=3$ ). The chi-square test allows for comparisons among multiple groups, in this case between selections when two packs were presented as well as selections when three packs were presented, by testing the hypothesis that the observed



**Figure 1.** Sets of cigarette packs presented to participants illustrating warning label style, message framing, size, attribution, and design characteristics  
FDA, U.S. Food and Drug Administration

frequencies do not differ from their expected values, which was specified to be equally distributed among choices. Mean values for the truthful and believability outcomes evaluated for health warning label message attribution were analyzed using ANOVA, with application of the Sidak test to adjust for experiment-wise error from multiple statistical testing. In order to examine how different pack selections might be influenced by a person's smoking status and type of cigarette smoked (among current smokers), a series of logistic regression analyses were performed.

For these analyses, the main outcome variables were the different pack selections, and the independent variables were either smoking status (smoker or nonsmoker) or type of cigarette smoked ("light/mild" vs full flavor) among current smokers. The analyses were adjusted for the following variables (categorical): age in years (18–24, 25–34, 35–44, 45–54, 55–64,  $\geq 65$ ); gender (male, female); race/ethnicity (white, non-Hispanic; black, non-Hispanic; Hispanic; Other, non-Hispanic); and education level (12 years or less; greater than 12 years); and for the smoker-only analysis, cigarettes per day (0–10, 11–20,  $\geq 21$ ). Where three packs were presented for selection as the dependent variable (size, attribution), multinomial logistic regression was utilized. Regression models were conducted to test if the adjusted models differ from what is presented; percentages presented in this manuscript are the unadjusted statistics.

## Results

### Sample Characteristics

Characteristics of the sample are shown in Table 1. Smokers who participated in the current study were significantly more likely to be male, younger, and have fewer years of formal education compared to the nonsmokers ( $\chi^2$  statistic,  $p$ -value  $< 0.05$ ). Among nonsmokers, 58% reported having ever smoked even one cigarette in their lifetime and 22% reported currently living with a smoker.

When asked questions regarding awareness of the current warning labels on cigarette packs sold in the U.S., 60% of smokers said they never or rarely noticed the labels in the past month, 87% of smokers said they did not attempt to avoid looking at or thinking about the warning labels, and 62% of smokers said that the labels made them think a little or not at all about the health risks of smoking.

Smokers were asked if their current brand choice decision was based on a number of factors, including tar and nicotine, health concerns, assistance in quitting, price, taste, or satisfaction. Of the 193 smokers (of a total of 197

**Table 1.** Demographics and tobacco use characteristics of sample of adult smokers and nonsmokers from western New York

Demographic characteristic	Smokers n=197 n (%)	Nonsmokers n=200 n (%)	Total N=397 n (%)
<b>Age (years)*</b>			
18–24	80 (41)	73 (37)	153 (39)
25–34	54 (27)	39 (20)	93 (23)
35–44	31 (16)	32 (16)	63 (16)
45–54	20 (10)	20 (10)	40 (10)
≥55	12 (7)	36 (19)	48 (12)
<b>Gender*</b>			
Male	118 (60)	85 (43)	203 (51)
Female	79 (40)	115 (58)	194 (49)
<b>Race/ethnicity</b>			
White, non-Hispanic	134 (68)	149 (75)	283 (71)
Black, non-Hispanic	35 (18)	27 (14)	62 (16)
Hispanic	14 (7)	13 (7)	27 (7)
Other, non-Hispanic	13 (7)	10 (5)	23 (6)
Refused	1 (1)	1 (1)	2 (1)
<b>Highest level of education*</b>			
Grade school or some high school	6 (0)	4 (2)	10 (3)
Completed high school	67 (34)	47 (24)	114 (29)
Technical or trade school	46 (23)	29 (15)	75 (19)
Some university	48 (24)	43 (22)	91 (23)
Completed university degree	28 (14)	60 (30)	88 (22)
Postgraduate degree	2 (1)	17 (9)	19 (5)
<b>Current tobacco use (among smokers only)</b>			
Some days (even a puff in last 30 days)	55 (28)	—	—
Every day	142 (72)	—	—
<b>Cigarettes per day (median=17)</b>			
0–10	77 (39)	—	—
11–20	51 (26)	—	—
≥21	69 (35)	—	—
<b>Ever tried to quit</b>			
No	47 (24)	—	—
Yes	150 (76)	—	—
<b>Planning to quit (months)</b>			
<1	48 (24)	—	—
1–6	49 (25)	—	—

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**Table 1.** Demographics and tobacco use characteristics of sample of adult smokers and nonsmokers from western New York (*continued*)

Demographic characteristic	Smokers n=197 n (%)	Nonsmokers n=200 n (%)	Total N=397 n (%)
>6	59 (30)	—	—
Not planning to quit	41 (21)	—	—
<b>Time to first cigarette (minutes)</b>			
≤5	41 (21)	—	—
6–30	35 (18)	—	—
31–60	37 (19)	—	—
≥60	84 (43)	—	—

\*Significant differences detected between smokers and nonsmokers,  $\chi^2$  statistic,  $p$ -value<0.05.

smokers) who responded to questions regarding this decision, a significantly greater percentage of “light/mild” cigarette smokers, compared to full-flavor cigarette smokers, stated that their current brand choice decision was based on health concerns (27% vs 4%, respectively;  $\chi^2=23.7$ ,  $p$ -value<0.001) or as a way to help them quit (11% vs 2%, respectively;  $\chi^2=6.8$ ,  $p$ -value=0.009). A significantly greater percentage of “light/mild” smokers also considered their usual brand of cigarettes to be “a little less harmful compared to other cigarettes brands” (29% “light/mild” vs 7% full-flavor cigarette smokers;  $n=194$ ;  $\chi^2=20.8$ ,  $p$ -value<0.001). On the other hand, more full-flavor cigarette smokers selected their current brand based on satisfaction (71% full flavor vs 55% “light/mild” cigarette smokers;  $\chi^2=4.8$ ,  $p$ -value=0.029).

As summarized in Table 2, when asked which pack they thought had the smoothest taste or which pack they would buy, a significantly greater number of participants were likely to choose the pack with the health warning label presented in a text format, in a smaller size, or with a gain-framed warning message. However, when asked which health warning would attract their attention, made them think about the health risks of smoking, motivated smokers to quit, and which pack they would buy to try to reduce health risks, participants chose the graphic, larger, and loss-framed warning label styles and formats ( $p$ -value<0.05). Smokers and nonsmokers also selected the graphic, larger, and loss-framed warning label styles when asked which warning they found to be the most effective ( $p$ -value<0.001).

When asked about perceptions regarding source attribution of message, a greater percentage of participants responded that they found the Surgeon General’s message to be the “most truthful” ( $\chi^2=108.6$ ,  $p$ -value<0.001) and the “most believable” ( $\chi^2=109.5$ ,  $p$ -value<0.001) of the three packs presented. Sixty-five percent (65%) of smokers stated

that the health warning attributed to the Surgeon General also made them think about quitting smoking.

### Pack Design Characteristics

The results for pack selection were fairly consistent across all six sets of pack design characteristics. Nearly 90% of participants selected the package labeled *full flavor*, 10, or with *dark blue* shading when asked which pack they perceived containing the most tar. Additionally, a significantly greater number of participants were likely to choose the pack that had the lighter color shading or descriptors that implied less risk (i.e., a lower number [6 versus 10], descriptors such as *light*, *smooth*, or *silver*, as compared to the pack labeled *full-flavor*) when asked which of the two packs would have the smoothest taste or which pack they would buy if trying to reduce the risks to their health ( $\chi^2$  statistic,  $p$ -value<0.001). Participants were more likely to select the *branded* pack when asked which pack they thought delivered the most tar, had the smoothest taste, was more attractive, appealed to youth aged <18 years, and contained cigarettes of better quality ( $\chi^2$  statistic,  $p$ -value≤0.001).

### Smokers Versus Nonsmokers

The responses of smokers and nonsmokers to the different sets of packs were similar with regards to ratings of expected delivery of tar, smoothest taste, or intentions to purchase if trying to reduce risks to their health. However, smokers were split as to which pack they might purchase, whereas nonsmokers consistently selected the packs that implied reduced risk. For example, when presented with two packs, one with a descriptor full flavor and the other with the descriptor smooth, nearly half of smokers selected each of the two packs (47% selected *full flavor* and 53% selected

**Table 2.** Frequencies (%) of pack selections given to pack sets illustrating warning label style, message framing, size, attribution, and design characteristics (N=397)

Measures	Graphic vs text warning: addiction			Graphic vs text warning: disease			Gain vs loss framing: emphysema			Gain vs loss framing: mouth cancer		
	Graphic	Text	Missing*	Graphic	Text	Missing*	Gain	Loss	Missing*	Gain	Loss	Missing*
Attract attention	86	14	0	86	14	0	35	65	0	25	75	1
Which one would you buy?	16	83	1	16	83	1	83	15	2	72	25	3
Which one would you buy if you were trying to reduce the risks to your health?	55**	43	2	58	40	2	68	32	1	63	34	3
Think about the health risks of smoking	91	8	1	91	9	1	15	84	1	16	83	0
Motivate smokers to quit	89	10	1	89	10	1	41	59	1	40	60	0
Most effective	90	10	1	89	11	1	32	68	0	24	76	0
Measures	Full flavor vs light			Full flavor vs smooth			Full flavor vs silver			Dark vs light shading		
	Full flavor	Light	Missing*	Full flavor	Smooth	Missing*	Full flavor	Silver	Missing*	Dark	Light	Missing*
Most tar	92	4	4	91	5	5	81	14	5	87	5	8
Smoothest taste	22	77	1	5	94	1	25	72	2	20	76	5
Which one would you buy?	38	62	0	37	62	2	46	52	1	37	61	2
Which one would you buy if you were trying to reduce the risks to your health?	4	94	2	9	88	4	18	78	4	8	87	5
Measures	Size of warning label: 30% vs 50% vs 100%				Plain packaging			Number: 10 vs 6				
	30	50	100	Missing*	Branded	Plain	Missing*	10	6	Missing*		
Most tar		24	5	56	15	54***	37	9	88	8	5	
Smoothest taste		55	16	12	18	69	25	6	22	71	7	
Attract attention		2	2	71	25 <sup>a</sup>	N/A	N/A	N/A	N/A	N/A	N/A	
Which one would you buy?		73	11	14	3	81	18	1	42	56***	2	
Which one would you buy if you were trying to reduce the risks to your health?		34	11	53	3	46	48	6	8	89	3	
Think about the health risks of smoking			1	3	72	25 <sup>a</sup>	N/A	N/A	N/A	N/A	N/A	
Motivate smokers to quit			2	1	73	25 <sup>a</sup>	N/A	N/A	N/A	N/A	N/A	
Most effective			2	4	70	25 <sup>a</sup>	N/A	N/A	N/A	N/A	N/A	
More attractive			N/A	N/A	N/A	N/A	97	3	1	N/A	N/A	
Appeal to youth aged <18 years			N/A	N/A	N/A	N/A	91	9	0	N/A	N/A	
Contains cigarettes of better quality			N/A	N/A	N/A	N/A	92	6	2	N/A	N/A	
Measures	Attribution of message: Surgeon General vs FDA vs none											
	None	Surgeon General	FDA	Missing*								
Most truthful		28	55	14	3							
How truthful (M: 1 [not]–7 [very])****		6.72	6.5	6.48								

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**Table 2.** Frequencies (%) of pack selections given to pack sets illustrating warning label style, message framing, size, attribution, and design characteristics (N=397) (continued)

Measures	Attribution of message: Surgeon General vs FDA vs none			
	None	Surgeon General	FDA	Missing*
Message you believe	25	<b>54</b>	14	6
How believable (M: 1 (not)–7 (very))***	6.58	6.57	6.57	
Which pack makes you think about quitting smoking?	22	<b>51</b>	14	13

Note: Boldface entries indicate significant difference ( $p$ -value<0.001) between responses based on  $\chi^2$  statistic.

\*Missing values were not included as valid responses in  $\chi^2$  statistic analyses.

\*\*Significant difference between responses based on  $\chi^2$  statistic,  $p$ -value=0.011

\*\*\*Significant difference between responses based on  $\chi^2$  statistic,  $p$ -value<0.005

\*\*\*\*Means were analyzed for significant differences using ANOVAs (Sidak correction applied); significant differences were not detected.

<sup>a</sup>Because of a technical error issue, 97 participants (24%) were not asked this question (68 nonsmokers and 29 smokers).

FDA, U.S. Food and Drug Administration

*smooth*) for purchase, whereas 72% of nonsmokers selected the pack labeled *smooth* ( $\chi^2=16.1$ ,  $p$ -value<0.001). Results from these analyses remained consistent after logistic regression analyses were conducted, adjusting for age, gender, race/ethnicity, and education (results not presented).

Smokers were also significantly more likely than nonsmokers to select the pack with the graphic health warning when asked, compared to the pack with the text-based health warning, which health warning was more likely to attract their attention (Brain vs text warning:  $\chi^2=5.3$ ,  $p$ -value=0.02; Smoker versus text warning:  $\chi^2=3.9$ ,  $p$ -value=0.05); which health warning was more likely to make people think about the health risks of smoking (Brain versus text warning:  $\chi^2=8.2$ ,  $p$ -value<0.01); was more likely to motivate smokers to quit (Brain versus text warning:  $\chi^2=4.5$ ,  $p$ -value=0.03); and is the most effective (Brain versus text warning:  $\chi^2=8.3$ ,  $p$ -value<0.01). Logistic regression analyses found that these differences were no longer significant after adjusting for age, gender, race/ethnicity, and education (results not presented). Additionally, no significant differences were detected between smokers and nonsmokers when examining selections made from sets of packs manipulated by message framing or plain packaging.

### Current Smokers: Full Flavor Versus “Light/Mild” Brands

Pack selections were analyzed after stratifying for smokers who currently reported smoking a full flavor versus any “light/mild” variety (light, ultra light, mild, or medium). Based on self-report, nearly 30% of smokers reported currently smoking a so-called low-tar variety of their cigarette brand. When asked to rate sets of packs that vary by descriptor for perception of smoothest taste, current smokers of “light/mild” brand cigarettes were

significantly more likely to select the pack that included a descriptor that implied reduced risk: *light* ( $\chi^2=5.5$ ,  $p$ -value=0.02); 6 ( $\chi^2=5.9$ ,  $p$ -value=0.02); or the pack with *light blue* shading ( $\chi^2=4.7$ ,  $p$ -value=0.03), as compared to current smokers of full-flavor cigarettes. Results from these analyses remained consistent after logistic regression analyses were conducted, adjusting for age, gender, race/ethnicity, education, and cigarettes per day.

### Discussion

Consistent with the findings recently reported in Canada, Australia, and the UK,<sup>13,16,19–21</sup> the results from this study confirm the hypothesis that consumers in the U.S. rate larger, graphic health warnings that convey a loss-framed message as most effective in communicating health risk information about smoking. Also consistent with previous studies,<sup>3,7,15,17,18,22</sup> after adjusting for demographic characteristics, these results did not vary with respect to smoking status.

The results from the current study are also consistent with previous research<sup>3,7,15,23,24</sup> indicating that characteristics of package design such as colors and product descriptors convey information to consumers about product characteristics and health risks. Pack colors and descriptors such as *smooth*, *silver* and lower numbers, such as 6, do in fact communicate relative risk messages to smokers and nonsmokers. The present study also found that smokers of low-tar brands were more likely than smokers of full-flavor cigarettes to rate the packs with lighter colors and misleading brand descriptors as lower in tar delivery and posing less risk to health, indicating that at least for some smokers, these package features influence purchasing choices. Although terms such as “light,” “mild,” or “low” have been banned, the FSPTCA gives the FDA authority to prohibit other descriptors or pack elements (e.g., colors) that are found to mislead consumers about the differential risks among brands.<sup>5</sup>

These findings also suggest that plain packaging may reduce many of the erroneous perceptions of risk communicated through design features on cigarette packs. This finding is supported by research by Wakefield et al.<sup>24,25</sup> as well, which found that compared with branded packs, smokers inferred that cigarettes from plain packs would be less rich in tobacco, less satisfying, and of lower-quality tobacco. Additionally, the more recent study by Wakefield et al.<sup>25</sup> found that plain packs were rated as less stylish, less sociable, and less attractive. In the present study, the use of a white background color for the plain packaging condition may offer a potential explanation for the finding that 46% of participants selecting the branded pack and 48% of participants selecting the plain pack when asked *Which one would you buy if you were trying to reduce the risks to your health?* Previous research has shown that plain packs are not perceived as less harmful when other colors, such as brown, are used as the standard background color.<sup>7</sup>

A limitation of the current study is the use of a sample of participants recruited from a single city in the Western New York region using a non-proportional quota sampling method, with quotas filled by smoking status. Thus, it cannot be concluded with certainty that the results from this study would necessarily generalize to a more representative sample of the U.S. population. However, although this was a relatively small sample, there was adequate statistical power to detect differences in the choice questions. In addition, the findings are highly consistent with those from other published studies<sup>3,7,15,17,18,22</sup> that have been carried out using different populations, in different locations, and in some cases using very different methodologies. The consistency of the current findings with those previously reported lends confidence that the results presented here are internally valid and robust.

Another limitation of this study, as noted in a similar study by Hammond and Parkinson,<sup>3</sup> is the “forced choice” nature of the pack ratings. Participants were asked to choose between two packs for each question posed; this method could potentially result in endorsement of a package design that might not have been chosen otherwise. Participants who did not select either pack presented were coded as missing for analysis purposes in this study; future studies might include a valid additional response option for participants to select if they choose neither pack presented for a particular question.

The findings of this study are relevant when trying to understand how consumers are likely to respond to government-mandated changes in package labeling. Although the FSPTCA barred the cigarette manufacturers

from using “light,” “mild,” and “low” brand descriptors on cigarette packs, several cigarette manufacturers have responded to this requirement by changing their pack designs and using alternate brand descriptors (such as “gold,” “silver,” “blue,” and “orange”). Therefore, although banning brand descriptors such as “light,” “mild,” and “low” is a positive step forward in reducing misperceptions that consumers hold about products that are essentially the same, manufacturers should also be barred from using colors and other package design gimmicks that perpetuate the myth of product differentiation.

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## References

- Slade J. The pack as advertisement. *Tob Control* 1997;6(3):169–70.
- Export Report prepared for: JTI Macdonald. The role of packaging seen through industry documents. Province of Quebec, District of Montreal: Supreme Court; 2001. Report No.: Defense Exhibit D–116.
- Hammond D, Parkinson C. The impact of cigarette package design on perceptions of risk. *J Public Health (Oxf)* 2009;31(3):345–53.
- International Agency for Research on Cancer. IARC handbooks of cancer prevention, tobacco control, vol. 12: methods for evaluating tobacco control policies. Lyon, France: IARC, 2008.
- Family Smoking Prevention and Tobacco Control Act, H.R. 1256, 111th Cong (2009).
- U.S. Dist. Ct. D. See *U.S. v. Philip Morris USA, Inc., et al.*, No. 99-CV-02496GK (Final Opinion). [www.tplp.org/doj](http://www.tplp.org/doj).
- Hammond D, Dockrell M, Arnott D, Lee A, McNeill A. Cigarette pack design and perceptions of risk among UK adults and youth. *Eur J Public Health* 2009;19:631–7.
- Cummings KM, Hyland A, Giovino GA, Hastrup J, Bauer J, Bansal MA. Are smokers adequately informed about the health risks of smoking and medicinal nicotine? *Nicotine Tob Res* 2004;6(3S):S333–40.
- Cummings KM, Hyland A, Bansal MA, Giovino GA. What do Marlboro Light smokers know about low tar cigarettes? *Nicotine Tob Res* 2004;6(3S):S323–32.
- Kozlowski LT, Goldberg ME, Yost BA, White EL, Sweeney CT, Pillitteri JL. Smokers’ misperceptions of light and ultra-light cigarettes may keep them smoking. *Am J Prev Med* 1998;15(1):9–16.
- Kozlowski LT, Pillitteri JL. Beliefs about “Light” and “Ultra Light” cigarettes and efforts to change those beliefs: an overview of early efforts and published research. *Tob Control* 2001;10(1S):i12–16.



12. National Cancer Institute. Risks associated with smoking cigarettes with low machine-measured yields of tar and nicotine. In: DHHS, NIH, National Cancer Institute, ed. Smoking and tobacco control monograph, 13. Bethesda MD, 2001.
13. Fong GT, Hammond D, Hitchman SC. The impact of pictures on the effectiveness of tobacco warnings. *Bull WHO* 2009;87(8):640–3.
14. WHO. WHO Framework Convention on Tobacco Control. Geneva, Switzerland: WHO Document Production Services, 2005.
15. Borland R, Fong GT, Yong HH, et al. What happened to smokers' beliefs about light cigarettes when "light/mild" brand descriptors were banned in the UK? Findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control* 2008;17(4):256–62.
16. Hammond D, Fong GT, Borland R, Cummings KM, McNeill A, Driezen P. Text and graphic warnings on cigarette packages: findings from the international tobacco control four country study. *Am J Prev Med* 2007;32(3):202–9.
17. Kees J, Burton S, Andrews JC, Kozup J. Understanding how graphic pictorial warnings work on cigarette packaging. *J Public Policy Marketing* 2010;29(2):115–26.
18. Nonnemaker J, Farrelly M, Kamyab K, Busey A, Mann N. Experimental study of graphic cigarette warning labels: final results report. Rockville MD: RTI International, 2010. Report No.: RTI Project No. 0212305.007.003.
19. Borland R, Wilson N, Fong GT, et al. Impact of graphic and text warnings on cigarette packs: findings from four countries over five years. *Tob Control* 2009;18(5):358–64.
20. Hammond D, Fong GT, McDonald PW, Cameron R, Brown KS. Impact of the graphic Canadian warning labels on adult smoking behaviour. *Tob Control* 2003;12(4):391–5.
21. Goodall C, Appiah O. Adolescents' perceptions of Canadian cigarette package warning labels: investigating the effects of message framing. *Health Commun* 2008;23(2):117–27.
22. Thrasher JF, Rousu MC, Naya-Ocampo R, Reynales-Shigematsu LM, Rillo-Santillan E, Hernandez-Avila M. Estimating the impact of different cigarette package warning label policies: the auction method. *Addict Behav* 2007;32(12):2916–25.
23. Wakefield M, Letcher T. My pack is cuter than your pack. *Tob Control* 2002;11(2):154–6.
24. Wakefield M, Morley C, Horan JK, Cummings KM. The cigarette pack as image: new evidence from tobacco industry documents. *Tob Control* 2002;11(1S):I73–80.
25. Wakefield MA, Germain D, Durkin SJ. How does increasingly plainer cigarette packaging influence adult smokers' perceptions about brand image? An experimental study. *Tob Control* 2008;17(6):416–21.

## Appendix

### Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.amepre.2011.01.021.

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