From: "James Middleton" [redacted]
To: <panel_hs@legco.gov.hk>
Cc: [redacted]

Date: Tuesday, December 20, 2016 11:16AM
Subject: SizeMatter s.pdf

Dear Panel on Health Services,

Please circulate this self-explanatory non exhaustive information on Size and Graphic Warnings to the members of the Panel.

We have added highlights for those members who wish to see the most salient points more readily.

Kind regards,

James Middleton

Chairman

http://cleartheair.org.hk

Attachments:

SizeMatters.pdf

Does Size Impact Attention and Recall of Graphic Health Warnings?

ARTICLE · NOVEMBER 2015

DOI: 10.18001/TRS.1.2.7

8 AUTHORS, INCLUDING:

Elizabeth G Klein

The Ohio State University

60 PUBLICATIONS **395** CITATIONS

SEE PROFILE

Abigail Shoben

The Ohio State University

32 PUBLICATIONS **420** CITATIONS

SEE PROFILE

Micah Berman

The Ohio State University

29 PUBLICATIONS **77** CITATIONS

SEE PROFILE

Ellen Peters

The Ohio State University

127 PUBLICATIONS **6,748** CITATIONS

SEE PROFILE

Does Size Impact Attention and Recall of Graphic Health Warnings?

Elizabeth G. Klein, PhD, MPH
Abigail B. Shoben, PhD
Sarah Krygowski, MPH
Amy Ferketich, PhD
Micah Berman, JD
Ellen Peters, PhD
Rao Unnava, PhD
Mary Ellen Wewers, PhD, MPH

Objective: To evaluate the attention paid to larger sizes of graphic health warnings (GHWs) embedded within cigarette advertisements so as to assess their impacts on rural smokers. **Methods:** Daily smokers (N = 298) were randomly assigned to view a cigarette advertisement with 3 conditions: 2 intervention conditions with GHW comprising 20% or 33% of the ad area, or a text-only control. Eye-tracking software measured attention in milliseconds. Binary outcome mediation was conducted. **Results:** Intervention participants spent 24% of their time viewing the GHWs, compared to 10% for control ($p < .01$). The odds of GHW recall in the combined (20% and 33%) intervention group were 3.3 times higher than controls. Total dwell time mediated 33% of the effect of the graphic condition on any recall. **Conclusions:** GHWs in 20% of cigarette advertisement space attracted significantly more attention than text-only warnings; larger GHWs did not increase attention. Attention was significantly associated with warning recall; total time viewing mediated warning recall. Tobacco ads should include GHWs to attract the attention of smokers.

Key words: smoking; graphic warning; advertising; eye tracking; health communication
Tobacco Regulatory Science. **2015;1(2):175-185**
DOI: http://dx.doi.org/10.18001/TRS.1.2.7

Cigarette advertising and promotion expenditures in the United States exceed $8.3 billion annually with approximately $23 million spent on magazine advertising.[1] This size of this amount demonstrates that advertising is a robust communication channel between tobacco companies and consumers. Exposure to cigarette advertisements predicts brand loyalty and brand switching behavior among smokers, and has been associated with increased cigarette consumption and continuation of smoking.[2] Tobacco product advertisements are inherently at odds with the overall intent of health warning labels, which aim to communicate information about the risks of tobacco use and promote cessation. Graphic warning labels convey the known dangers of tobacco products and are required on tobacco product packaging in over 60 countries globally.[3] Most of these countries also have implemented comprehensive bans on tobacco advertising, rendering graphic warnings within advertisements unnecessary.[4] In 2009, the United States Congress passed the Family Smoking Prevention and Tobacco Control Act, requiring graphic warnings to be placed on ciga-

Elizabeth G. Klein, Division of Health Behavior & Health Promotion, The Ohio State University College of Public Health, Columbus, OH. Abigail B. Shoben, Division of Biostatistics, The Ohio State University College of Public Health, Columbus, OH. Sarah Krygowski, Division of Health Behavior & Health Promotion, The Ohio State University College of Public Health, Columbus, OH. Amy Ferketich, Division of Epidemiology, The Ohio State University College of Public Health, Columbus, OH. Micah Berman, Division of Health Services, Management and Policy, The Ohio State University College of Public Health, Columbus, OH. Ellen Peters, Department of Psychology, The Ohio State University College of Arts & Sciences, Columbus, OH. Rao Unnava, Department of Marketing and Logistics, The Ohio State University Fisher College of Business, Columbus, OH. Mary Ellen Wewers, Division of Health Behavior & Health Promotion, The Ohio State University College of Public Health, Columbus, OH. Correspondence Dr Klein; klein.232@osu.edu

rette packaging and on the top 20% of advertisements for cigarettes. Although the Food and Drug Administration (FDA) issued a rule implementing this requirement, the FDA's rule was legally challenged in 2012,[5] and a new graphic warning labels are under development.[6]

Although the processing of information in health-warning messages is complex, to be effective, a critical first step is to draw attention so that consumers can understand, recall, and use the information for health decision making.[7,8] Thus, attention paid to health warning labels is hypothesized to be necessary for informing consumers regarding smoking risks, and it may influence behavioral intent to quit smoking.[9] We can improve our understanding of consumer reactions to GHWs (and the effectiveness of GHW characteristics) through research using eye-tracking equipment, which allows for detailed capture of precise eye movements when an individual is exposed to visual stimuli.[10] A limited number of eye-tracking studies have focused on GHWs and demonstrated that graphic images draw greater attention than non-graphic warnings.[11,12] Other studies, however, have found that smokers avoid warnings placed on product packaging.[13-15]

Regionally, rural residents have a higher prevalence of smoking and are more likely to be exposed to secondhand smoke, creating a disproportionate increase in risk for tobacco-related illness.[16] In addition, tobacco control campaigns tend to focus on urban media markets,[17] which further reduce the reach of public health messages among rural residents. Compared to the rest of the nation, Ohio is a region with higher rates of smoking, smokeless and dual use of tobacco products,[18] with the highest rates observed within the rural, Appalachian counties of the state.[19,20] The nature of tobacco use in this largely rural region is known to be complex, with environmental, psychological, and social influences that portray tobacco products as traditional and normative.[21-23] Due to lower penetration of formal and informal tobacco control policies in this area,[16] it is reasonable to assume residents have a greater exposure to tobacco use as well as greater exposure to tobacco marketing which contribute to the vulnerability to tobacco use for rural Appalachian residents.[24]

Outside of the US, countries have adopted GHWs, mostly on product packaging,[4] that exceed the recommendations of the Framework Convention on Tobacco Control (FCTC), suggesting movement toward larger warning messages. As non-eye-tracking survey data have supported that warning size increases warning effectiveness,[25] the purpose of this study was to evaluate the attention paid to larger sizes of health warning labels embedded within cigarette advertisements to assess their impacts on the vulnerable population of Ohio Appalachian smokers. Our primary hypothesis was that smokers exposed to larger GHWs would demonstrate increased attention, as measured by eye-tracking equipment dwell time (in seconds), when compared to those exposed to smaller GHWs or text-only warnings. Additionally, we hypothesized that increased attention (as measured by dwell time) would mediate an expected association between larger versus smaller or no GHWs and greater recall.

METHODS

Participants

Data were gathered as a part of the Ohio Health Warning Label (OHWL) study on tobacco users within a rural, underserved region (Ohio Appalachia) between April and October 2013. A convenience sample was recruited using flyers and brochures. Participants were invited to provide perceptions of advertising for consumer products, with recruitment materials distributed to businesses and advertisements placed in local newspapers; being a current smoker was not identified as a requirement for participation. A phone screening determined if participants met study eligibility criteria: current daily cigarette smoker; lifetime history of smoking at least 100 cigarettes; aged 21 or older; and living in one of the 32 counties designated as a part of Ohio Appalachia. Participants were excluded if they intended to quit within 30 days or if they had a history of certain eye conditions, such as macular degeneration, glaucoma, or cataracts, which are known to interfere with eye tracking equipment. Participants who completed the experiment received a $50 gift card; those unable to be calibrated on eye-tracking equipment received a $10 gift card.

Procedures

All research sessions were conducted in private areas within an office environment. Trained inter-

Table 1
Product Advertisements and Post-advertisement Survey Items from the Ohio Health Warning Label (OHWL) Study

Product	Brand	Post-advertisement Survey Item	Response Categories
USB Drive	iFlashDrive	I feel confident using technology.	1-10 scale from strongly agree to strongly disagree
Orange Juice	Tropiciana	There is at least one full serving of fruit in 100% juice.	1-10 scale from strongly agree to strongly disagree
Macaroni and Cheese	Kraft	This product is a healthy choice for my family.	1-10 scale from strongly agree to strongly disagree
Cigarettes	American Spirit	I am craving a cigarette right now.	1-10 scale from strongly agree to strongly disagree
Energy Drink	5 hour energy	This product is a safe way to boost my energy.	1-10 scale from strongly agree to strongly disagree
Alcohol	Jose Cuervo	This advertisement is meant for people who are…?	<18, 18-20, 21+ years old

viewers explained the study and obtained signed informed consent. Participants were seated comfortably in a chair within a typical viewing distance (24 to 32 inches) from a monitor equipped with the eye-tracking system and underwent calibration procedures 3 times to assure data quality before the initiation of the experiment.

Participants were instructed to imagine they were flipping through a magazine while they moved at their own pace through the experiment, answering an on-screen question after each advertisement in order to standardize a participant's gaze between advertisements. Each participant viewed a total of 6 advertisements; one cigarette ad (always shown fourth) and 5 others for common consumer products: alcohol; a USB drive; macaroni and cheese dinner; orange juice; and an energy drink. Table 1 shows the chosen brands, corresponding survey items, and response categories for each on-screen survey question.

The cigarette brand selected for this experiment was based on it not being popular among smokers in Appalachian Ohio (Wewers ME et al, unpublished data, January 2012) and its use of simple graphic and text imagery. An unpopular brand was selected to minimize differential attention and recall, as smokers are highly brand loyal, and form beliefs and perceptions of the product from marketing.[12,26,27] All participants viewed the selected advertisement, and were randomly assigned to one of 3 warning label study conditions: a control condition with text only, or a graphic warning label that covered either 20% or 33% of the ad area (intervention conditions, referred to as large and standard graphic, respectively). Intervention conditions differed only on the amount of space that was occupied within the ad. The amount of space allocated to the non-warning-label portion of the advertisement was fixed across all conditions; blank space (consistent with the overall aesthetics of the ad) varied by condition and was largest in the text-only condition and smallest in the 33% condition. Nine versions of the FDA-proposed warning labels[28] were used, yielding 27 unique tobacco advertisements across these 3 study conditions; the control condition matched the 9 text-only messages of the warning messages. At the end of the experiment, a survey was administered by a trained interviewer. The entire protocol took approximately 45 minutes to complete.

Measures

Eye tracking measures. BeGaze software (SensoMotoric Instruments, 60 Hz RED System) was used to display the experimental stimuli (advertisements) and capture the eye-tracking data. For this analysis, the term "warning label" refers to any warning message that uses text-only or text and graphic imagery, "warning text" refers only to the textual message of the portion of a warning label, and "graphic image" refers only to the visual imagery of a warning label. The primary outcome measure was dwell time (in seconds) as a measure of attention on specific areas of interest; these ar-

Figure 1
Cigarette Warning Advertisements with Study Conditions: Control, Standard Warning Label, Large Warning Label

A. Control label **B. 20% warning label (standard)** **c. 33% warning label (large)**

Note.
Areas of interest are labeled as (1) whole advertisement, (2) warning label, (3) packages, (4) "Natural," (5) "Tastes better," (6) advertisement small text, (7) graphic warning text, (8) total graphic warning, (9) Quit line.

eas were defined *a priori* for all advertisements viewed. In particular, areas of interest (AOIs) were constructed for both the warning label and the advertisement itself (the non-warning label space). Figure 1 displays the 3 study conditions. These AOIs included the (1) whole advertisement, (2) warning label, (3) cigarette packages, 2 large blocks of text with the words (4) "Natural," (5) "Tastes better," (6) a block of the advertisement small text, (7) graphic warning text (eg, "cigarettes are addictive"), (8) total graphic warning label, and (9) Quitline (1-800-QUIT-NOW telephone number). For each AOI listed above, the following things were measured: (1) the duration of dwell time in it in seconds; (2) the proportion of viewing time in it (calculated based on its duration of dwell time divided by total dwell time on the advertisement): (3) the first AOI to be viewed, referred to as the first fixation; and (4) revisits, measured as the sum of any repeat views to the AOI after a participant's initial viewing. Any sections of the advertisement that were not viewed were counted as zero revisits.[29]

Survey measures. Participant recall of the health warning label was determined by a series of questions that followed the conclusion of the experiment (eg, "What do you remember about the cigarette advertisement? You can describe any pictures you remember and all of the words you can recall.") No visual aids were given to participants as a recall aid, and field staff recorded participant responses verbatim. Two trained coders (EGK, SEK) reviewed the responses independently, and assigned codes dichotomously (yes/no) for several elements: any recall of the GHW; recall of any elements of the warning text; recall of the graphic image; and recall of the Quitline (1-800-QUIT NOW). For all 4 recall elements, the kappa coefficient for inter-rater reliability was high, ranging from 98% to 100% (95% confidence interval of 95%-100%); consensus meetings were held to resolve coding disagreements.

Survey data were captured by self-report during the screening process, the experiment, and post-experiment. Items included demographic factors of age, race/ethnicity, annual household income, marital status, and sex. Behavioral factors included

Table 2
Descriptive Characteristics of Appalachian Smokers from the Ohio Health Warning Label (OHWL) Study

OHWL study (N = 298) Participant Characteristics	Total (N = 298)	Text Only (N = 103)	Standard Graphic (N = 97)	Large Graphic (N = 98)
Demographics				
Male	33.2%	32.0%	34.0%	33.7%
Mean age (SD) (in years)	40.5 (11.7)	39.7 (11.8)	40.5 (10.5)	41.5 (12.8)
Mean (SD) household size	3.0 (1.5)	3.1 (1.6)	3.2 (1.6)	2.8 (1.4)
% Household income				
<$15,000	37.9%	43.7%	33.0%	36.7%
$15-$24,999	27.2%	25.2%	25.8%	30.6%
$25-$34,999	15.8%	14.6%	20.6%	12.2%
$35-$49,999	10.4%	9.7%	10.3%	11.2%
≥$50,000	8.7%	6.8%	10.3%	9.2%
% Education				
<High school	22.5%	25.2%	18.6%	23.5%
High school	45.0%	43.7%	45.4%	45.9%
>High school	32.5%	31.1%	36.0%	30.6%
Has health insurance	68.8%	67.0%	73.2%	66.3%
Smoking Behaviors				
Mean age (SD) of initiation	17.5 (5.6)	17.6 (5.8)	17.6 (6.2)	17.3 (4.9)
% (n) Ever made serious quit attempt	80.5% (239)	83.5% (86)	81.4% (79)	76.3% (74)
Mean (SD) years smoking	21.9 (11.9)	20.7 (11.8)	22.5 (10.6)	22.7 (13.2)
Mean (SD) cigarettes per day	18.1 (8.7)	18.1 (8.7)	17.3 (8.4)	18.8 (9.1)
Mean (SD) heaviness of smoking index	2.98 (1.52)	2.96 (1.47)	2.93 (1.58)	3.04 (1.5)

age of smoking initiation (in years), score (0 to 6) on the Heaviness of Smoking index,[30] and a history of quitting smoking for at least 24 hours (yes/no).

Analysis

Eye-tracking measures were compared among all 3 conditions. Differences in continuous outcome measures by group were assessed via ANOVA F-tests. No gross violations of the equal variance assumption of ANOVA were found in any of the continuous variables assessed. Differences in binary outcomes (including any recall) were assessed via Wald chi-square tests. If the primary comparison (among all groups) was statistically significant, pairwise comparisons were done using Tukey (ANOVA) and Bonferroni (chi-square) *post hoc* tests.[31]

Binary outcome mediation[32] analysis by logistic regression was used to explore the possibility that dwell time on the warning label mediated the effect of study condition on recall of the warning label. For these analyses only, the 2 graphic conditions were collapsed into one group so that the comparison was graphic versus text warning. Briefly, mediation analysis decomposes the total effect (c) into the mediated (indirect) effect (ab) and the direct effect (c'). If all of the effect of the treatment (graphic condition) could be explained by the mediator (dwell time), the remaining direct effect (after adjustment for the mediator) would be null.

Statistical significance was set at .05, and no adjustments were made for multiple comparisons. Due to the highly correlated outcomes, a Bonferroni correction (using alpha = .0029) is likely conservative. The sample size was estimated based on modest differences published in previous research.[11]

Table 3
Means (SD) and Proportions (N) for Dwell Times and Fixations by Condition of Warning Label and Non-warning Label of a Cigarette Advertisement from the Ohio Health Warning Label (OHWL) Study

OHWL study (N = 298)	Text only (N = 103)	Standard graphic (N = 97)	Large graphic (N = 98)	p-value
Seconds of Dwell Time (SD)				
Comparison alcohol ad	7.66 (4.11)	6.87 (3.87)	7.32 (4.50)	.42
Cigarette ad (including warning label)	12.74 (9.36)	11.60 (7.52)	12.81 (9.46)	.56
"Natural"	0.87 (1.15)	0.72 (0.64)	0.60 (0.50)	.06
"Tastes better"	1.40 (1.79)	1.11 (1.15)	0.97 (1.20)	.09
Cigarette packages	**1.66 (1.39)**	**1.31 (1.40)**	**1.25 (1.14)**	**.03** [b]
Ad small text	3.63 (5.19)	2.25 (3.59)	2.59 (3.82)	.06
Warning label	**0.99 (1.20)**	**2.36 (1.94)**	**2.53 (1.83)**	**< .01** [a,b]
Percentage of Total Time				
% on warning label	**9.6 (11.7)**	**24.1 (17.4)**	**24.7 (16.8)**	**< .01**[a,b]
% on warning text only	9.6 (11.7)	10.4 (9.9)	11.2 (10.4)	.50
% on graphic image only*	--	13.7 (12.5)	13.7 (11.2)	.99
% on Quitline*	--	1.3 (2.3)	1.4 (2.3)	.59
Fixation and Revisits				
First fixation on warning label	**21.4% (n=22)**	**40.2% (n=39)**	**41.8% (n=41)**	**< .01** [a,b]
Fixated on warning label	85.4% (n=88)	92.8% (n=90)	91.8% (n=90)	.17
# of revisits to warning label**	**0.6 (0.9)**	**1.3 (1.4)**	**1.3 (1.2)**	**< .01** [a,b]

*** These comparisons include only individuals in the 2 intervention conditions had the opportunity to view the graphic warning elements**
**** Among those who fixated on the warning label at least once**

Note.
Shaded boxes indicate p < .05 when the 3 conditions were compared
SD = standard deviation
a = Pairwise comparison of text vs standard graphic significant
b = Pairwise comparison of text vs large graphic significant
c = Pairwise comparison of standard graphic vs large graphic significant

Data were analyzed using SAS 9.3 (SAS Institute, Inc.; Cary, North Carolina) and STATA 13 (StataCorp; College Station, Texas).

RESULTS

Overall, 300 participants completed the eye-tracking experiment and post-experiment survey; 12 participants were unable to be calibrated to the eye tracking equipment and 2 participants were excluded from the final analyses due to problems with incomplete eye-tracking data. The final sample (N = 298) was mostly female (66%), with an average age of 40 years; most participants (~65%) had lower educational attainment (high school or less) and lower income (below $25,000 annual household income) as the data in Table 2 show. The mean age of becoming a regular smoker was 17.5 years and participants reported an average of 21 years smoking. Participants smoked an average of 18 cigarettes per day and the mean heaviness of smoking was 2.98, approximately equal to the cutoff of 3.0 that defines high nicotine dependence.[33] The majority smoked Marlboro (61%) and none reported current use of the experimental brand (data not

Table 4
Percentage of Any Unaided Recall of Graphic Warning Label Elements by Condition from the Ohio Health Warning Label (OHWL) Study

OHWL study (N = 298)	Control (N = 103)	20% (N = 97)	33% (N = 98)	p-value
Any warning label recall (N)	**31% (32)**	**63% (61)**	**56% (55)**	**< .01**
Any text element recall (N)	16% (16)	27% (26)	20% (20)	0.15
Any graphic image recall (N) [a]	--	40% (39)	39% (38)	0.84
Quit line recall (N) [a]	--	6% (6)	4% (4)	0.51

Note.
Shaded boxes indicate p < .05
a = These comparisons include only individuals in the intervention conditions who viewed the graphic warning elements

shown.) Participants were balanced between study conditions, and no statistically significant differences existed in demographic characteristics among study conditions.

Viewing of the Advertisement

Table 3 summarizes the viewing patterns by study condition. The entire cigarette advertisement including the warning label was viewed, on average, for 12 seconds by participants in all 3 conditions (F=0.58, df=2, p = .56); total dwell time for the comparison advertisements did not differ significantly by condition but was shorter than the cigarette advertisement (result for the alcohol ad shown in the first row of Table 3; other data not shown are available by request). There were statistically significant differences in the mean dwell time on the cigarette packages by study condition (F=3.67, df=2, p = .03). There were no other statistically significant differences in the dwell time paid to other (non-warning) cigarette advertisement elements by study condition.

Total dwell time on the warning label was higher in both graphic conditions compared to the text-only condition (F=25.7, df=2, p < .01). Participants in both intervention conditions spent approximately 24% of their dwell time viewing the warning label, compared to less than 10% of the dwell time for control participants (F=31.2, df=2, p < .01). Almost twice as many participants in the intervention conditions viewed the warning label first, compared to those in the control condition (42%, 40%, and 21% in the large graphic, standard graphic, and text-only conditions, respectively; χ^2=11.6, df=2, p = .03). Participants in both intervention conditions averaged 1.3 revisits to the area of the warning label, compared to 0.6 revisits for those in the control condition (F=9.5, df=2, p < .01).

Recall of the Warning Label and Mediation by Dwell Time

Because there were no statistically significant differences in dwell time between the 2 intervention conditions, these graphic conditions were collapsed for the mediation analysis. Recall of any portion of the warning label was higher in both graphic conditions (56% and 63%, respectively, in the large and standard graphic groups) compared to the text-only control condition (31%; χ^2=22.7, p < .01; Table 4). Participants in the 2 graphic conditions were similar with respect to recall of the graphic image itself, the text of the warning label, and the Quitline.

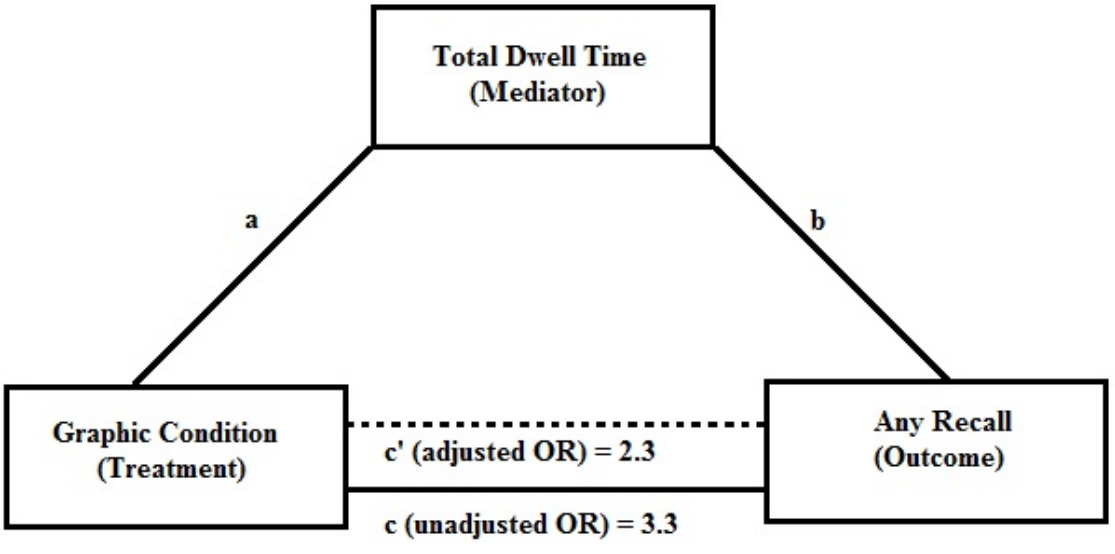
Mediation Analysis

In the unadjusted analysis, the odds of any recall of the warning label in the combined graphic warning label group were 3.3 times the odds of any recall in the control group. After adjusting for total dwell time on the warning label, this odds ratio decreased to 2.3 (Figure 2); total dwell time mediated 33% of the effect of graphic condition on any recall. This effect was statistically significant as the bootstrapped 95% CI excluded 0 (95% CI: 15% to 67%).

DISCUSSION

Our study is the first to evaluate the impact of

Figure 2
Diagram of Mediation Analysis



warning label size within cigarette advertisements on consumer attention. It provides empirical support for the proposition that graphic warning labels occupying at least 20% of advertising space attract significantly greater attention than smaller text only warnings. Not only did they attract more attention, but this attention mediated the effects of graphicness on memory for the warnings. In other words, having a graphic warning compared to a text-only warning caused greater attention to be drawn to it which, in turn, led to greater recall of the warning. Research on graphic warning labels implemented outside the US has indicated that warning label size is related to warning effectiveness, measured by reading and noticing GHWs, cognitive responses of thoughts of harm or quitting, or behavioral intentions to change smoking behavior.[9,34] Although we did not find that increasing the size of graphic warnings from 20% to 33% of an advertisement's space significantly increased smokers' attention or attracted repeat views, our findings support that smokers are attending to and recalling health warning messages. Attention and noticing GHWs stimulate reactions from smokers that predict quit attempts.[9]

Our findings regarding the proportion of time spent on the advertisement relative to the warning label demonstrated that graphic warnings not only attract attention, but distract smokers from viewing other visual portions of the advertisement. We believe these findings highlight the importance of the GHWs themselves, as well as the context in which they are viewed by consumers. Two smaller eye-tracking studies where participants avoided pack-based warning messages, instead focused on cigarette brand information.[13,35] Both studies used non-preferred brands of cigarette packs rather than product advertisements; thus, GHWs on cigarette packs may produce different responses from the same GHWs in advertisements. Alternatively, it may be that consumers' attention threshold was reached at 20% of advertisements space; additional studies are warranted to explore means to attract the attention of smokers to GHWs in advertisements, as it is critically important to make the warnings less "invisible" to the consumer's eye. Advertising studies have investigated the issue of congruency, or fit between the advertiser and the editorial content, and found improved consumer recognition of advertisements and incongruency improved attention and recall.[36-38] Regardless of placement on tobacco products or advertisements, future research also is needed to improve understanding of warning-label factors that can be optimized to avoid message fatigue and sustain positive effects on consumers, especially considering that tobacco advertisements

are likely to change in response to GHWs being added to advertising space.[25]

Regardless of the presence on packs or within ads, our results contribute to a robust research base demonstrating that GHWs are more effective at influencing consumer attention and/or desirable tobacco reduction behaviors than text-only messages.[12,25,35,39-50] As the research on GHWs continues to grow, additional research is needed to understand the optimum characteristics of warning labels within advertisements for all tobacco products, including those products that will be newly subject to FDA regulation following the FDA "deeming" process announced in April 2014.[51]

The present research has some important limitations. Participants were excluded if they intended to quit smoking in the next month, so the current findings may not be applicable to smokers with immediate quit intentions. Although brain imaging studies have demonstrated variations in the response to individual GHW imagery,[39] the present study was not powered to evaluate differences among the 9 individual GHWs viewed, as roughly 30 participants viewed each of the warnings. Each participant viewed a single advertisement of a nondominant cigarette brand that used textual and graphic components. Such an ad may produce different results from advertisements that use other types of images, including people and preferred brands. Further, we cannot evaluate whether the use of an implicit health claim (the emphasis on the word "Natural" within the ad) impacted smokers' attention or recall. The selected study design also did not include a text-only condition at 20% of the advertisement space, so we cannot determine whether greater attention could be attracted with a larger text-only warning label. Nonetheless, our results suggest a consistency in the total viewing time regardless of the portion of space allocated to the health warning, and a reduction in time spent on one ad component that appeared due to the presence versus absence of a graphic image rather than being based on the portion of allocated space to the health warning. The unaided recall was coded as any mention of warning label elements, and did not differentiate between recall of text message or warning imagery. The present study focused on rural smokers, but future studies should consider rural residences along with other vulnerable tobacco users including youth, young adults, and others considered high-risk tobacco users.

Graphic warning labels are used around the globe; they are recommended as an effective tobacco control tool on both products and advertisements. The guidelines for the Framework Convention on Tobacco Control (FCTC) note that each country "whose constitution or constitutional principles impose constraints on undertaking a comprehensive ban should, under Article 13 of the Convention, apply restrictions that are as comprehensive as possible in the light of those constraints."[52] Given that the First Amendment likely precludes a comprehensive ban on tobacco advertising in the US, the FDA instead should move forward with requiring graphic health warnings on tobacco advertisements.

IMPLICATIONS FOR TOBACCO REGULATION

Understanding the optimum characteristics of health warning labels is critically important for policymakers to consider as they seek to reduce the prevalence of smoking. Although the images used in the present study will be redesigned by the FDA, our findings support the value of placing warning labels on at least 20% of the area of tobacco advertisements, as required by the Family Smoking Prevention and Tobacco Control Act. Our results provide empirical support for the use of graphic warnings within cigarette advertising as a means to attract attention of smokers.

Human Subjects Approval Statement

The study protocol was approved by The Ohio State University Institutional Review Board.

Conflict of Interest Disclosure Statement

All authors of this article declare they have no conflicts of interest.

Acknowledgments

Research reported in this publication was supported by grant number R01CA129771-03S1from the National Cancer Institute and FDA Center for Tobacco Products (CTP). The content is solely the responsibility of the authors and does not necessarily represent the official views of the Na-

tional Institutes of Health or the Food and Drug Administration.

References

1. Federal Trade Commission. Cigarette report for 2011. 2013. Available at: http://www.ftc.gov/sites/default/files/documents/reports/federal-trade-commission-cigarette-report-2011/130521cigarettereport.pdf/. Accessed March15, 2015.
2. Capella M, Webster C, Kinard BR. A review of the effect of cigarette advertising. *Int J Res Mark.* 2011;28(3):269-279.
3. Canadian Cancer Society. Cigarette package health warnings: international status report. 2014. Available at: http://global.tobaccofreekids.org/files/pdfs/en/WL_status_report_en.pdf/. Accessed March 13, 2015.
4. World Health Organization. Global progress report on implementation of the WHO Framework Convention. 2012. Available at: http://apps.who.int/iris/handle/10665/79170. Accessed March15, 2015.
5. Almasy S. FDA changes course on graphic warning labels for cigarettes. 2013. Available at: http://www.cnn.com/2013/03/19/health/fda-graphic-tobacco-warnings/. Accessed March 12, 2015.
6. Kraemer JD, Baig SA. Analysis of legal and scientific issues in court challenges to graphic tobacco warnings. *Am J Prev Med.* 2013;45(3):334-342.
7. Kees J, Burton S, Andrews JC, Kozup J. Understanding how graphic pictorial warnings work on cigarette packaging. *Journal of Public Policy & Marketing.* 2010;29(2):265-276.
8. Peters E. Anticipating barriers to the communication of critical information. In: Schulkin J, Anderson B, ed. *Numerical Reasoning in Judgments and Decision Making about Health*. Cambridge, UK: Cambridge University Press; 2014.
9. Borland R, Yong HH, Wilson N, et al. How reactions to cigarette packet health warnings influence quitting: findings from the ITC Four-Country survey. *Addiction.* 2009;104(4):669-675.
10. Duchwoski A. *Eye Tracking Methodology - Theory and Practice.* 2nd ed. London, UK: Springer-Verlag; 2007.
11. Peterson E, Thomsen S, Lindsay G, John K. Adolescents' attention to traditional and graphic tobacco warning labels: an eye-tracking approach. *J Drug Educ.* 2010;40(3):227-244.
12. Strasser AA, Tang KZ, Romer D, et al. Graphic warning labels in cigarette advertisements: recall and viewing patterns. *Am J Prev Med.* 2012;43(1):41-47.
13. Maynard OM, Attwood A, O'Brien L, et al. Avoidance of cigarette pack health warnings among regular cigarette smokers. *Drug Alcohol Depend.* 2014;136:170-174.
14. Maynard OM, Munafo MR, Leonards U. Visual attention to health warnings on plain tobacco packaging in adolescent smokers and non-smokers. *Addiction.* 2013;108(2):413-419.
15. Munafo MR, Roberts N, Bauld L, Leonards U. Plain packaging increases visual attention to health warnings on cigarette packs in non-smokers and weekly smokers but not daily smokers. *Addiction.* 2011;106(8):1505-1510.
16. Vander Weg MW, Cunningham CL, Howren MB, Cai X. Tobacco use and exposure in rural areas: findings from the Behavioral Risk Factor Surveillance System. *Addict Behav.* 2011;36(3):231-236.
17. Duke JC, Vallone DM, Allen JA, et al. Increasing youths' exposure to a tobacco prevention media campaign in rural and low-population-density communities. *Am J Public Health.* 2009;99(12):2210-2216.
18. Centers for Disease Control and Prevention. State-specific prevalence of cigarette smoking and smokeless tobacco use – United States, 2009. *MMWR Morb Mortal Wkly Rep.* 2010;59(43):1400-1406.
19. Ohio Medicaid Assessment Survey. Columbus, Ohio: The Ohio Colleges of Medicine Government Resource Center; 2012. Available at: http://grc.osu.edu/omas/datadownloads/2012omaspublicdata/. Accessed March 25, 2015.
20. Wewers ME, Katz M, Fickle D, Paskett ED. Risky behaviors among Ohio Appalachian adults. *Prev Chronic Dis.* 2006;3(4):A127.
21. Ahijevych K, Kuun P, Christman S, et al. Beliefs about tobacco among Appalachian current and former users. *Appl Nurs Res.* 2003;16(2):93-102.
22. Liu S, Nemeth JM, Klein EG, et al. Adolescent and adult perceptions of traditional and novel smokeless tobacco products and packaging in rural Ohio. *Tob Control.* 2014;23(3):209-214.
23. Nemeth J, Liu ST, Klein EG, et al. Factors influencing smokeless tobacco use in rural Ohio Appalachia. *J Commun Health.* 2012;37(6):1208-1217.
24. Klein E, Ferketich AK, Abdel-Rasoul M, et al. Smokeless tobacco marketing and sales practices in Appalachian Ohio following federal regulations. *Nicotine Tob Res.* 2012;14(7):880-884.
25. 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):358-364.
26. Pollay RW, Dewhirst T. The dark side of marketing seemingly "Light" cigarettes: successful images and failed fact. *Tob Control.* 2002;11(Suppl 1):i18-i31.
27. Shiffman S, Pillitteri JL, Burton SL, et al. Smokers' beliefs about "Light" and "Ultra Light" cigarettes. *Tob Control.* 2001;10(Suppl)1:i17-i23.
28. Food & Drug Administration. Cigarette health warnings. 2013. Available at: http://www.fda.gov/tobaccoproducts/labeling/labeling/cigarettewarninglabels/default.htm/. Accessed June 3, 2014.
29. Smith K, Moriarty S, Kenney K, Barbatsis G. *Handbook of Visual Communication: Theory, Methods and Media.* Mahwah, NJ: Lawrence Erlbaum Associates; 2005.
30. Borland R, Yong HH, O'Connor RJ, et al. The reliability and predictive validity of the Heaviness of Smoking Index and its two components: findings from the International Tobacco Control Four Country study. *Nicotine Tob Res.* 2010;12(Suppl):S45-S50.
31. Rosner B. *Fundamentals of Biostatistics.* 7th ed. Boston, MA: Brooks/Cole Cengage Learning; 2011.
32. Mackinnon D, Dwyer JH. Estimating mediated effects in prevention studies. *Evaluation Rev.* 1993;17(2):144-158.
33. Schnoll RA, Goren A, Annunziata K, Suaya JA. The prevalence, predictors and associated health outcomes of high

nicotine dependence using three measures among US smokers. *Addiction.* 2013;108(11):1989-2000.
34. Azagba S, Sharaf MF. The effect of graphic cigarette warning labels on smoking behavior: evidence from the Canadian experience. *Nicotine Tob Res.* 2013;15(3):708-717.
35. Süssenbach P, Niemeier S, Glock S. Effects of and attention to graphic warning labels on cigarette packages. *Psychol Health.* 2013;28(10):1192-1206.
36. Burke M, Hornof A, Nilsen E, Gorman N. High-cost banner blindness: ads increase perceived workload, hinder visual search, and are forgotten. *ACM Transactions on Computer-Human Interaction (TOCHI).* 2005;12(4):423-445.
37. Hervet G, Guérard K, Tremblay S, Chtourou MS. Is banner blindness genuine? Eye tracking internet text advertising. *Appl Cognit Psychol.* 2011;25(5):708-716.
38. Simola J, Kivikangas M, Kuisma J, Krause CM. Attention and memory for newspaper advertisements: effects of ad–editorial congruency and location. *Appl Cognit Psychol.* 2013;27(4):429-442.
39. Wang AL, Lowen SB, Romer D, et al. Emotional reaction facilitates the brain and behavioural impact of graphic cigarette warning labels in smokers. *Tob Control.* 2015 Jan 6. pii: tobaccocontrol-2014-051993. doi: 10.1136/tobaccocontrol-2014-051993. [Epub ahead of print]
40. Nonnemaker JM, Choiniere CJ, Farrelly MC, et al. Reactions to graphic health warnings in the United States. *Health Educ Res.* 2015;30(1):46-56.
41. McQueen A, Kreuter MW, Boyum S, et al. Reactions to FDA-proposed graphic warning labels affixed to US smokers' cigarette packs. *Nicotine Tob Res.* 2015 Jan 14. pii: ntu339. Doi: 10.1093/ntr/ntu339 [Epub ahead of print] DOI:
42. Cameron LD, Pepper JK, Brewer NT. Responses of young adults to graphic warning labels for cigarette packages. *Tob Control.* 2015;24(e1):e14-e22.
43. Mays D, Niaura RS, Evans WD, et al. Cigarette packaging and health warnings: the impact of plain packaging and message framing on young smokers. *Tob Control.* 2015;24(e1): e-87-e92.
44. Thrasher JF, Rousu MC, Hammond D, et al. Estimating the impact of pictorial health warnings and "plain" cigarette packaging: evidence from experimental auctions among adult smokers in the United States. *Health Policy.* 2011;102(1):41-48.
45. Bansal-Travers M, Hammond D, Smith P, Cummings KM. The impact of cigarette pack design, descriptors, and warning labels on risk perception in the U.S. *Am J Prev Med.* 2011;40(6):674-682.
46. Vardavas CI, Connolly G, Karamanolis K, Kafatos A. Adolescents perceived effectiveness of the proposed European graphic tobacco warning labels. *Eur J Public Health.* 2009;19(2):212-217.
47. Thrasher JF, Rousu MC, Anaya-Ocampo R, et al. Estimating the impact of different cigarette package warning label policies: the auction method. *Addict Behav.* 2007;32(12):2916-2925.
48. Thrasher JF, Hammond D, Fong GT, Arillo-Santillan E. Smokers' reactions to cigarette package warnings with graphic imagery and with only text: a comparison between Mexico and Canada. *Salud Publica Mex.* 2007;49(Suppl 2):S233-S240.
49. Hammond D, Fong GT, Borland R, et al. Text and graphic warnings on cigarette packages: findings from the international tobacco control four country study. *Am J Prev Med.* 2007;32(3):202-209.
50. Kees J, Burton S, Andrews JC, Kozup J. Tests of graphic visuals and cigarette package warning combinations: implications for the Framework Convention on Tobacco Control. *Journal of Public Policy & Marketing.* 2006;25:212-223.
51. Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act, as Amended by the Family Smoking Prevention and Tobacco Control Act; Regulations on the Sale and Distribution of Tobacco Products and Required Warning Statements for Tobacco Products. *Proposed rule*: Federal Register; 2014:23141-23207.
52. World Health Organization. WHO Framework Convention on Tobacco Control. 2003. Available at: http://www.who.int/fctc/text_download/en/. Accessed April 3, 2015.

A12.1.3 Evidence about the effects of health warnings

Show / hide chapter menu

There is no doubt that health warnings have fulfilled their primary objective of informing consumers about the health risks of smoking. While health warnings that clearly informed consumers about the risks of smoking without changing the behaviour of a single person could be deemed effective in these terms, there has also been considerable interest as to whether health warnings are associated with changes in attitudes and behaviours that are known to be associated with reduced levels of smoking.

In its comprehensive scientific handbook outlining appropriate methods for the evaluation of tobacco control policies, the International Agency for Research on Cancer discusses the difficulty of assessing the impacts of warnings in the context of multiple sources of influence in knowledge about health risks.[1] It states 'there are serious problems in attributing changes in national-level trends to changes in health warnings, or any other individual policy measure.' p314 It recommends instead that governments implementing health warnings assess effectiveness by monitoring a variety of measures of noticeability, believability, attention to health risks, comprehension, *intention* to quit, use of cessation services and perceived helpfulness of warnings in quit attempts–refer Chapter 5.5.

Most of the early population research[i] about the effectiveness of tobacco health warnings introduced in particular countries comes from studies of Australian warnings introduced in 1987 and 1995.[2–5] Then there were evaluations of Canada's world first graphic warnings in late 2000,[5–7] and then numerous studies which have assessed the effects of Australia's 2006 graphic warnings.[8–16] Numerous further studies have now been published assessing the effects of warnings in a variety of other jurisdictions. A comprehensive review of evidence published in Tobacco Control in 2011[17] identified a total of 94 original articles published up to December 2010 on the topic of the effectiveness of health warnings describing 72 quantitative studies, 16 qualitative studies, 5 studies with both quantitative and qualitative components and 1 review article. Research articles came from Canada (n= 35), the US (n= 29), Australia (n=16), the UK (n=13), the Netherlands (n=3), France (n = 3), New Zealand (n=3), the Netherlands (n=3), Mexico (n=3), Brazil (n =2),[18] Malaysia[19] and China (n=1) Belgium (n=1), Norway (n=1) as well as other European countries (n= 10). Analysis of results of surveys comparing impacts of the introduction of different sorts of health warnings at different times in different countries[5,8,9,20,21 ii] have been particularly valuable in establishing the effectiveness of warnings and the elements and characteristics of warnings[22] likely to be most effective. Since the Hammond review, further studies have been published using data from Germany,[23] China,[24] Germany, a study covering France the UK and the Netherlands,[20] Australia[13,14]... and in 14 mainly developing Asian and European countries.[25]

Several organisations and international research groups have now summarised the findings of research on health warnings. Hammond's review[17] builds on a comprehensive assessment of the impact of health warnings internationally released in May 2009 by the International Tobacco Control Policy Evaluation Project (the ITC Project)[iii].[27] The Sambrook Research Group summarised the evidence to 2008[28] in preparation for design of new health warnings in the European Union. The International Union Against Tuberculosis and Lung Disease and Tobacco-Free Union also summarised the evidence to 2009 in a technical guide[29] designed for countries aiming to meet their obligations under the FCTC. This section (A12.1.3) extracts from these reviews the most important findings to date about what is known about the real-world impact of warnings where they have been implemented. Section A12.1.4 outlines what is known (from both international comparative research and focus groups studies) about features of warnings believed to maximise their effectiveness. This includes a detailed discussion of the superiority of graphic over text-based warnings and the role of fear in prompting behaviour changes and the issue of unintended consequences. The results of studies assessing the impact of graphic health warnings introduced in Australia in 2006 are described more fully in Section A12.1.5.

A12.1.3.1 Awareness of health warnings

As identified by Hammond,[17] at least a dozen studies to December 2010 have documented high levels of awareness for health warnings on tobacco packages[3,7,10,18,19,30–37] Studies published since 2010 continue to show that introduction of stronger health warnings results in warnings being more frequently noticed and read.[25] More smokers report getting information about the risks of smoking from health warnings than from any other source except TV in a majority of countries (Hammond[17] citing the ITC Evaluation project report[27].)

Hammond's review has also found that health warnings are a prominent source of health information for young non-smokers and the general public.[17] citing [10,31–34] Non-smokers have high level of recall for specific messages on

packs.[10,33,34]

A12.1.3.2 Increase in knowledge about health effects

Awareness of concepts covered in health warnings has been high in studies following introduction of warnings in Belgium[38] and across seven European countries after 2003.[39] Awareness of conditions covered in health warnings is higher than awareness of conditions not covered at the time by warnings.[12,40] Smokers have greater knowledge about particular health effects in countries where those health effects are the subject of warnings than in countries where they are not.[5,27,41] Introduction of new or strengthened warnings has been shown to have increased knowledge of the subject matter contained in the warnings in Canada,[42] in Australia in 1987,[2] 1995[3] and 2006,[11–13,16] in the UK in 2003[5] and in France in 2006.[43]

A12.1.3.3 Increase in thoughts about quitting

Health warnings can invoke thoughts not just about the harms of smoking but also thoughts about quitting,[25] and they occasionally lead to smokers forgoing cigarettes they would otherwise have smoked.[44] Stronger warnings stimulate more of these reactions, including fear reactions.[23] Some smokers also take steps to avoid stronger warnings, this being more so for graphic than text warnings.[8,9,21] In all cases studied, new warnings (strengthened either with increased size and/or use of graphics) have been more effective in stimulating targeted reactions than those they replaced. Some of this effect is due to novelty, but it is clear that objectively stronger messages persistently evoke greater levels of responses than weaker ones.

A12.1.3.4 Self-reported usefulness in quitting

Population surveys conducted after the introduction of large text or graphic health warnings suggest that they have been important in assisting smokers to try to smoke less or to try to quit. One-fifth of smokers reported such effects after introduction of enlarged text warnings in the EU from 2001.[34] In countries such as Canada and Australia even higher percentages of people report warnings as having helped them. More than 40% of smokers in one Canadian survey reported that health warnings had motivated them to quit smoking.[21] In response to a Government-sponsored survey in 2008[10] 57% of smokers reported that graphic health warnings had made them think about quitting and 34% reported them having helped them to try to quit.

A12.1.3.5 Documented quit attempts

Data from an Australian study,[4] evaluation of the introduction of graphic warnings in Canada[44] and analysis of data from Australia, Canada, the US and UK in the longitudinal International Tobacco Control cohort study[9] show that behaviours such as noticing cigarette warnings and forgoing cigarettes predict subsequent quitting attempts among individual smokers.

The mission of the International Tobacco Control Policy Evaluation Project (ITC Project) is to measure the psychosocial and behavioural impact of key policies of the Framework Convention on Tobacco Control (FCTC) among adult smokers.[26] [iv] Reaction to health warnings in each wave of the study (2002 to 2006) were used to predict quitting in subsequent waves, controlling for country (proxy for warning differences) and other factors.[9] These analyses were replicated on four wave-to-wave transitions. Warning salience, cognitive responses (thoughts of harm and of quitting), forgoing of cigarettes and avoidance of warnings were examined among smokers from Australia, Canada, the United Kingdom and the United States as predictors of quit attempts, and of quitting success among those who tried (one month sustained abstinence), replicated across four wave-to-wave transitions. All four responses to warnings were independently predictive of quitting activity in bivariate analyses. In multivariate analyses, both forgoing cigarettes and cognitive responses to the warnings predicted prospectively making quit attempts in all replications. However, avoiding warnings did not add predictive value consistently, and there was no consistent pattern for warning salience. There were no interactions by country. Some, but not all, of the effects were mediated by quitting intentions. There were no consistent effects on quit success. This study added to the evidence that forgoing cigarettes as a result of noticing warnings and quit-related cognitive reactions to warnings are consistent prospective predictors of making quit attempts.

A12.1.3.6 Effect on use of Quitlines

Introducing graphic cigarette packet warnings and the Quitline number on cigarette packets boosts demand for Quitline services with likely flow on effects to cessation.

In the Netherlands, placement of the national Quitline number on packs with text-based warnings led to a marked increase in numbers of calls.[45] Calls to the Quitline in Australia also increased after introduction of improved consumer product information in 2006, which included a requirement to list the Quitline number.[15] This study shows that even in a 'mature' tobacco control environment such as Australia, such an intervention has considerable positive impact on demand for a Quitline, with positive implications for quitting.

After the New Zealand Quitline number was featured prominently on packets, awareness and use of the service

increased.[46–48]

A12.1.3.7 Effects of health warnings on young people

Only a small number of studies have examined the effects of the introduction of health warnings on young people.[10,11,32,33,49–52]

There is good evidence that health warnings on tobacco packaging have influenced young people's attitudes, intentions and smoking behaviour in the UK[33] Canada[32,53,54] and Australia.[10,11]

In a national survey in the UK, 90% of youth non-smokers reported that warnings had 'put them off smoking'.[33] National representative surveys of more than 26 000 respondents from 27 EU member states and Norway found that 3 out of 10 non-smokers reported that health warnings had been effective in discouraging them from smoking.[34] Hammond notes[17] that between one-fifth and two-thirds of youth non-smokers indicated that health warnings had helped prevent them from taking up smoking in Canada[32] and Australia[10]–see Section A12.1.5.1 for further details.

A12.1.3.8 Effectiveness among low-income smokers and other sub-populations

A study conducted as part of the International Tobacco Control Policy Evaluation study examined (i) smokers' ratings of the health warnings on warning salience, thoughts of harm and quitting and forgoing of cigarettes; (ii) impact of the warnings using a Labels Impact Index (LII), with higher scores signifying greater impact; and (iii) differences on the LII by demographic characteristics and smoking behaviour among smokers exposed to strengthened text warnings introduced in France (2007), Germany (2007), the Netherlands (2008) and the UK (2006).[20] The impact was highest among smokers of low socio-economic status. The EU survey also found that young people and manual workers were slightly more likely to perceive health warnings as effective.[34] See Section A12.1.4 for discussion about benefits of graphic warnings for those with limited levels of literacy. Preliminary evidence suggests that countries with pictorial warnings demonstrate fewer disparities in health knowledge across educational levels.[55]

A12.1.3.9 Evidence of wear-out of health warnings

Australian research shows that the peak levels of response to warnings is in the period immediately after their introduction onto packs,[3] perhaps even before all packs on the market have the warnings.[56] There is some decline in cognitive responses as consumers become used to seeing the images on the packs; warnings appear to lose some, but not all, of their impact with time.[5, 8, 15] This finding is reflected in the results of a population survey of smokers and recent ex-smokers. Among the 23% of smokers and recent ex-smokers who reported in the 2010 National Drugs Strategy Household Survey[57] having attempted to quit or cut down smoking in the previous year 15.2% mentioned health warnings as being a factor motivating their behaviour. This was down from 19.4% in 2007 (shortly after introduction of the new pictorial health warnings) which in turn was higher than the 16.4% naming health warnings as a motivator in 2004[58] shortly before the introduction of the new warnings.

Evidence presented to a Canadian Parliamentary committee in 2010 suggested that the effectiveness of the Canadian warnings declined by 30–60% over the seven years to 2009, and that new warning labels were urgently needed to strengthen their influence in helping smokers to quit and preventing new smokers from starting to smoke.[59]

A12.1.3.10 Industry attempts to undermine the effectiveness of health warnings

In 2011, British American Tobacco International released a report claiming that health warnings have had little impact on sales of tobacco products in Australia and elsewhere.[60] This report included an analysis relating introduction dates for health warnings to sales of cigarettes in each country. As explained by the International Agency for Research on Cancer[1] immediate changes in behaviour as would be reflected in changes in smoking prevalence or sales are an unrealistic and inappropriate indicator of the effectiveness of health warnings.

Opposition to the introduction of improved health warnings by tobacco companies–and attempts to undermine their effectiveness once introduced–suggests that tobacco industry executives believe that warnings can contribute to population changes in the consumption of tobacco products.[61] Despite the requirement for warnings to be rotated with equal frequency, some researchers believe that tobacco companies may be producing a higher proportion of packs using warnings perceived to be less disturbing, with a lower proportion of packs bearing the more hard-hitting warnings. Following the introduction of seven rotating graphic health warnings in New Zealand in 2008, researchers found that tobacco packs identified in a litter-collection study were more likely to carry one of the warnings rated less disturbing (such as a pregnant women with infant or damaged lungs) in preference to the more highly disturbing warnings (such as gangrenous toes, mouth cancer and blindness).[62]

The effectiveness of heath warning has also been undermined by promotional stickers[63] and other design features on the packs[64] which are visually distracting.

Several researchers have highlighted the potential of package design to undermine the impact of health warnings. This is one important rationale for calls for plain packaging of tobacco products–see Chapter 11, Section 11.10.4 for full details.

i Research on the impact in the population of actual package warnings assessed after implementation

ii These were each counted in the Hammond Review as one study, but recorded in multiple jurisdictions.

iii The ITC Project is an ongoing international study that now covers 19 countries around the world.[26]

iv The evaluation framework 'utilises multiple country controls, a longitudinal design, and a pre-specified, theory-driven conceptual model to test hypotheses about the anticipated effects of specific policies.' The ITC Project consists of parallel prospective cohort surveys of representative samples of adult smokers in multiple countries, with further countries being added as the study continues. 'Collectively, the ITC surveys constitute the first-ever international cohort study of tobacco use. The conceptual model of the ITC Project draws on the psychosocial and health communication literature and assumes that tobacco control policies influence tobacco related behaviours through a causal chain of psychological events, with some variables more closely related to the policy itself (policy-specific variables) and other variables that are more downstream from the policy, which have been identified by health behaviour and social psychological theories as being important causal precursors of behaviour (psychosocial mediators).' [26]

References

1. International Agency for Research on Cancer. Methods for evaluating tobacco control policies Handbooks of Cancer Prevention, Tobacco Control, 12. Lyon, France: International Agency for Research on Cancer, 2009. Available from: http://com.iarc.fr/en/publications/pdfs-online/prev/handbook12/index.php

2. Hill D. New cigarette-packet warnings: are they getting through? Medical Journal of Australia 1988;148(9):478–80. Available from: http://www.ncbi.nlm.nih.gov/pubmed/3362083?dopt=Abstract

3. Borland R and Hill D. Initial impact of the new Australian tobacco health warnings on knowledge and beliefs. Tobacco Control 1997;6(4):317–25. Available from: http://tc.bmjjournals.com/cgi/content/abstract/6/4/317

4. Borland R. Tobacco health warnings and smoking-related cognitions and behaviours. Addiction 1997;92(11):1427–35. Available from: http://www3.interscience.wiley.com/journal/120194864/abstract

5. Hammond D, Fong GT, McNeill A, Borland R and Cummings KM. Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: findings from the International Tobacco Control (ITC) Four Country Survey. Tobacco Control 2006;15(suppl. 3):iii19–25. Available from: http://tc.bmjjournals.com/cgi/content/abstract/15/suppl_3/iii19

6. Martens D. Graphic tobacco warnings having desired effect. Canadian Medical Association Journal 2002;166(11):1453. Available from: http://www.cmaj.ca/cgi/content/full/166/11/1453

7. Hammond D, Fong GT, McDonald PW, Cameron R and Brown KS. Impact of the graphic Canadian warning labels on adult smoking behaviour. Tobacco Control 2003;12(4):391–5. Available from: http://tc.bmjjournals.com/cgi/content/abstract/12/4/391

8. Borland R, Wilson N, Fong GT, Hammond D, Cummings KM, Yong HH, *et al.* Impact of graphic and text warnings on cigarette packs: findings from four countries over five years. Tobacco Control 2009;18(5):358-64. Available from: http://tobaccocontrol.bmj.com/cgi/content/abstract/18/5/358

9. Borland R, Yong H, Wilson N, Fong G, Hammond D, Cummings K, *et al.* How reactions to cigarette packet health warnings influence quitting: findings from the ITC Four-Country survey. Addiction 2009;104(4):669-75. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19215595

10. Shanahan P and Elliott D. Evaluation of the Effectiveness of the Graphic Health Warnings on Tobacco Product Packaging 2008. Canberra: Department of Health and Ageing, 2009. Available from: http://www.health.gov.au/internet/main/publishing.nsf/Content/F22B9115FD392DA5CA257588007DA955/$File/hw-eval-full-report.pdf

11. White V, Webster B and Wakefield M. Do graphic health warning labels have an impact on adolescents' smoking-related beliefs and behaviours? Addiction 2008;103(9):1562–71. Available from: http://www.ncbi.nlm.nih.gov/pubmed/18783508

12. McCarthy M, Germain D, Brennan E and Durkin S. Perceptions about the health effects of smoking and passive smoking among Victorian adults, 2003–2007. CBRC Research Paper Series no. 37 Melbourne: Centre for Behavioural Research in Cancer, The Cancer Council Victoria, August, 2007. Available from: http://www.cancervic.org.au/perceptions_smoking_cbrc_09.html

13. Brennan E, Durkin SJ, Cotter T, Harper T and Wakefield MA. Mass media campaigns designed to support new pictorial health warnings on cigarette packets: evidence of a complementary relationship. Tobacco Control 2011;20(6):412-18. Available from: http://tobaccocontrol.bmj.com/content/early/2011/04/07/tc.2010.039321.abstract

14. Miller C, Hill D, Quester P and Hiller J. Response of mass media, tobacco industry and smokers to the introduction of graphic cigarette pack warnings in Australia. European Journal of Public Health 2009;19(6):644-9. Available from: http://eurpub.oxfordjournals.org/cgi/content/abstract/ckp089v1

15. Miller C, Hill D, Quester P and Hiller J. Impact on the Australian Quitline of new graphic cigarette pack warnings including the Quitline number. Tobacco Control 2009;18(3):235-7. Available from: http://tobaccocontrol.bmj.com/content/18/3/235.full

16. Miller C, Quester P, Hill D and Hiller J. Smokers' recall of Australian graphic cigarette packet warnings and awareness

of associated health effects, 2005-2008. BMC Public Health 2011;11(1):238. Available from: http://www.biomedcentral.com/content/pdf/1471-2458-11-238.pdf

17. Hammond D. Health warning messages on tobacco products: a review. Tobacco Control 2011;on line first Available from: http://tobaccocontrol.bmj.com/content/early/2011/05/23/tc.2010.037630.abstract

18. Cavalcante T. Labelling and packaging in Brazil. National Cancer Institute, Health Ministry of Brazil; World Health Organization, 2010. Available from: http://www.who.int/tobacco/training/success_stories/en/best_practices_brazil_labelling.pdf

19. Fathelrahman A, Omar M, Awang R, Borland R, Fong G, Hammond D, *et al.* Smokers' responses toward cigarette pack warning labels in predicting quit intention, stage of change, and self-efficacy. Nicotine & Tobacco Research 2009;11(3):248-53. Available from: http://ntr.oxfordjournals.org/content/early/2009/01/01/ntr.ntn029.abstract

20. Hitchman S, Mons U, Nagelhout G, Guignard R, McNeill A, Willemsen M, *et al.* Effectiveness of the European Union text-only cigarette health warnings: findings from four countries. European Journal of Public Health 2011;[Epub ahead of print] Available from: http://eurpub.oxfordjournals.org/content/early/2011/09/14/eurpub.ckr099.long

21. Hammond D, Fong G, Borland R, Cummings KM, McNeill A and Driezen P. Text and graphic warnings on cigarette packages: findings from the international tobacco control four country study. American Journal of Preventive Medicine 2007;32(3):202–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17296472

22. Fong GT, Hammond D and Hitchman SC. The impact of pictures on the effectiveness of tobacco warnings. Bulletin of the World Health Organization 2009;87(8):640–3. Available from: http://www.who.int/bulletin/volumes/87/8/09-069575/en/index.html

23. Schneider S, Gadinger M and Fischer A. Does the effect go up in smoke? A randomized controlled trial of pictorial warnings on cigarette packaging. Patient Education and Counseling 2011;[Epub ahead of print] Available from: http://www.ncbi.nlm.nih.gov/pubmed/21482060

24. Qin Y, Wu M, Pan X, Xiang Q, Huang J, Gu Z, *et al*. Reactions of Chinese adults to warning labels on cigarette packages: a survey in Jiangsu Province. BMC Public Health 2011;11:133. Available from: http://www.biomedcentral.com/content/pdf/1471-2458-11-133.pdf

25. Caixeta RB, Blanco A, Fouad H, Khoury RN, Sinha DN, Rarick J, *et al*. Cigarette package health warnings and interest in quitting smoking--- 14 countries, 2008--2010. Morbidity and Mortality Weekly Report (MMWR) 2011;60(20):645–51. Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6020a2.htm

26. Fong GT, Cummings KM, Borland R, Hastings G, Hyland A, Giovino GA, *et al*. The conceptual framework of the International Tobacco Control (ITC) Policy Evaluation Project. Tobacco Control 2006;15(suppl. 3):iii3-11. Available from: http://tc.bmjjournals.com/cgi/content/abstract/15/suppl_3/iii3

27. International Tobacco Control Policy Evaluation Project. FCTC Article 11 Tobacco warning labels: evidence and recommendations from the ITC Project. Buffalo, New York: Roswell Park Cancer Institute, 2009. Available from: http://roswellttturc.org/ITCwarningreport.pdf

28. Sambrook Research International. A review of the science base to support the development of health warnings for tobacco packages. A report prepared for European Commission, Directorate General for Health and Consumers. Brussels: European Commission, 2009. Available from: http://ec.europa.eu/health/tobacco/docs/warnings_report_en.pdf

29. Selin H. Tobacco packaging and labelling: technical guide. International Union Against Tuberculosis and Lung Disease and Tobacco-Free Union, 2010. Available from: http://www.tobaccofreeunion.org/files/186.pdf

30. Elliott and Shanahan Research. Evaluation of the health warnings and explanatory health messages on tobacco products. Canberra: Tobacco and Alcohol Strategies Section, Department of Health and Aged Care, 2000. Available from: http://www.health.gov.au/internet/main/publishing.nsf/content/4FA9E17EB0A1FB6ECA25776900054914/$File/warneval.pdf

31. Chaiton M, Cohen J, Kaiserman MJ and Leatherdale ST. Ch 7. Beliefs and attitudes. Youth Smoking Survey-Technical Report. Health Canada, 2002. Ottawa: Health Canada, 2005. Available from: http://www.hc-sc.gc.ca/hc-ps/pubs/tobac-tabac/yss-etj-2002/index-eng.php

32. Environics Research Group Ltd. The health effects of tobacco and health warning messages on cigarette packages: survey of youth: wave12 surveys. Ottawa: Health Canada, 2007. Available from: http://www.hc-sc.gc.ca/hc-ps/tobac-tabac/research-recherche/por-rop/label-etiquet-eng.php

33. Moodie C, Mackintosh A and Hammond D. Adolescents' response to text-only tobacco health warnings: results from the 2008 UK Youth Tobacco Policy Survey. European Journal of Public Health 2009;20(4):463-9. Available from: http://eurpub.oxfordjournals.org/cgi/content/full/ckp199v1

34. European Commission. Eurobarometer: survey on tobacco (analytical report). 2009. Available from: http://ec.europa.eu/public_opinion/flash/fl_253_en.pdf

35. Environics Research Group Ltd. Health warnings testing: final report. Ottawa: Prepared for Health Canada, 1999. Available from: http://legacy.library.ucsf.edu/tid/nql70g00

36. Les E´tudes De Marche Createc. Quantitative study of Canadian youth smokers and vulnerable non-smokers: effects of modified packaging through increasing the size of warnings on cigarette packages. Prepared for Health Canada. Ottawa: Health Canada, 2008. Available from: http://www.tobaccolabels.ca/healt/canada2008w3

37. Les E´tudes De Marche Createc. Quantitative study of Canadian adult smokers and vulnerable non-smokers: effects of modified packaging through increasing the size of warnings on cigarette packages. Prepared for Health Canada. Ottawa: Health Canada, 2008. Available from: http://epe.lac-bac.gc.ca/100/200/301/pwgsc-tpsgc/por-ef/health/2008/254-07a-e/report.pdf

38. IPSOS. Survey, Belgium. Effectiveness of picture warnings on behalf of the Belgium Cancer Foundation. cited in Sambrook Research International, 2007.

39. Devlin E, Anderson S, Hastings G and MacFadyen L. Targeting smokers via tobacco product labelling: opportunities and challenges for Pan European health promotion. Health Promotion International 2005;20(1):41-9. Available from: http://heapro.oxfordjournals.org/content/20/1/41.full.pdf+html

40. Ng D, Roxburgh S, Sanjay S and Au Eong K. Awareness of smoking risks and attitudes towards graphic health warning labels on cigarette packs: a cross-cultural study of two populations in Singapore and Scotland. Eye 2009;24(5):864-8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19696800?dopt=Citation

41. Thrasher J, Hammond D, Fong G and Arillo-Santillán E. Smokers' reactions to cigarette package warnings with graphic imagery and with only text: a comparison between Mexico and Canada. Salud pública de México 2007;49(suppl. 2):S233-40.

42. Environics Research Group Ltd. The health effects of tobacco and health warning messages on cigarette packages: survey of adults and adult smokers: Wave 9 surveys. Ottawa: Health Canada, 2005. Available from: http://www.smoke-free.ca/warnings/WarningsResearch/POR-04-19%20Final%20Report%205552%20Adult%20wave%209.pdf

43. Fong G, Ratte S and Craig L ea. E´valuation des politiques de lutte contre le tabagisme en France: re´sultats de la premie`re vague de l'enque^te ITC France. Evaluating tobacco control policies in France: Results of the first wave of the ITC France Survey. Bulletin E´pide´miologique Hebdomadaire (Nume´ro the´matiquedJourne´e mondiale sans tabac 2008. (Special IssuedWorld No Tobacco Day 2008). Weekly Epidemiological Bulletin 2007;22:183-7. Available from: http://www.invs.sante.fr/beh/

44. Hammond D, Fong G, McDonald P, Brown K and Cameron R. Graphic Canadian cigarette warning labels and adverse outcomes: evidence from Canadian smokers. American Journal of Public Health 2004;94(8):1442–5. Available from: http://www.ajph.org/cgi/content/full/94/8/1442

45. Willemsen MC, Simons C and Zeeman G. Impact of the new EU health warnings on the Dutch quit line. Tobacco Control 2002;11(4):381–2. Available from: http://tobaccocontrol.bmj.com/cgi/content/full/11/4/381

46. Wilson N, Weerasekera D, Hoek J, Li J and Edwards R. Increased smoker recognition of a national quitline number following introduction of improved pack warnings: ITC Project New Zealand. Nicotine & Tobacco Research 2010;12(suppl.):S72–7. Available from: http://ntr.oxfordjournals.org/content/12/suppl_1/S72.long

47. Li J and Grigg M. New Zealand: new graphic warnings encourage registrations with the quitline. Tobacco Control 2009;18(1):72. Available from: http://tobaccocontrol.bmj.com/content/18/1/72.full?sid=1283a803-1cbe-4db3-9956-ee41b10ae647

48. Wilson N, Li J, Hoek J, Edwards R and Peace J. Long-term benefit of increasing the prominence of a quitline number on cigarette packaging: 3 years of Quitline call data. New Zealand Medical Journal 2010;123(1321):109-11. Available from: Wilson N, Li J, Hoek J, Edwards R, Peace J.

49. Robinson T and Killen J. Do cigarette warning labels reduce smoking? Paradoxical effects among adolescents. Archives of Pediatrics & Adolescent Medicine 1997;151(3):267-72. Available from: http://www.ncbi.nlm.nih.gov/pubmed/9080935

50. Ho R. Cigarette advertising and cigarette health warnings: what role do adolescents' motives for smoking play in their assessment? Australian Psychologist 1994;29(1):49-56. Available from: http://onlinelibrary.wiley.com/doi/10.1080/00050069408257321/abstract

51. O'Hegarty M, Pedersen L, Nelson D, Mowery P, Gable J and Wortley M. Reactions of young adult smokers to warning labels on cigarette packages. American Journal of Preventative Medicine 2006;30(6):467–73. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16704939

52. Peterson E, Thomsen S, Lindsay G and John K. Adolescents' attention to traditional and graphic tobacco warning labels: an eye-tracking approach. Journal of Drug Education 2010;40(3):227–44. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21313984

53. Goodall C and Appiah O. Adolescents' perceptions of Canadian cigarette package warning labels: investigating the effects of message framing. Health Communication 2008;23(2):117–27. Available from: http://www.informaworld.com/smpp/content?content=10.1080/10410230801967825

54. Sabbane LI, Lowrey TM and Chebat J-C. The effectiveness of cigarette warning label threats on nonsmoking adolescents. Journal of Consumer Affairs 2009;43(2):332–45. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1745-6606.2009.01142.x/abstract

55. Siahpush M, McNeill A, Hammond D and Fong GT. Socioeconomic and country variations in knowledge of health risks of tobacco smoking and toxic constituents of smoke: results from the 2002 International Tobacco Control (ITC) Four Country Survey. Tobacco Control 2006;15(suppl. 3):iii65-70. Available from: http://tobaccocontrol.bmj.com/content/15/suppl_3/iii65.abstract

56. Trotter L. Tobacco health warnings: longitudinal evaluation effects on recall and smoking related behaviours. Quit Evaluation Studies no. 9. The Anti-Cancer Council of Victoria, 1998 133-42. Available from: http://www.quit.org.au/downloads/QE/QE9/QE9Home.html

57. Australian Institute of Health and Welfare. 2010 National Drug Strategy Household Survey: survey report. Drug statistics series no. 25, AIHW cat. no. PHE 145. Canberra: AIHW, 2011. Available from: http://www.aihw.gov.au/publication-detail/?id=32212254712&libID=32212254712&tab=2

58. Australian Institute of Health and Welfare. 2004 National Drug Strategy Household Survey: detailed findings. Drug strategy series no.16, AIHW cat. no. PHE 66. Canberra: AIHW, 2005. Available from: http://www.aihw.gov.au/publications/phe/ndshsdf04/ndshsdf04.pdf

59. McEwen K. ITC evidence of Canadian warning label wear-out presented to policymakers. International Tobacco Control Policy Evaluation Project, December, 2010 [viewed 25 March 2009] . Available from: http://www.itcproject.org/blogs/mediacover/itcevidenceofcanadianwarninglabelwearoutpresentedt

60. Deloitte. Tobacco packaging regulation: An international assessment of the intended and unintended consequences. London: 2011. Available from: http://www.bat.com/group/sites/uk__3mnfen.nsf/wPagesWebLive/DO8GHFEN/$FILE/medMD8GHFFW.pdf?openelement

61. Chapman S and Carter SM. 'Avoid health warnings on all tobacco products for just as long as we can': a history of Australian tobacco industry efforts to avoid, delay and dilute health warnings on cigarettes. Tobacco Control 2003;12(suppl. 3):iii13–22. Available from: http://tc.bmjjournals.com/cgi/content/abstract/12/suppl_3/iii13

62. Wilson N. Smokers respond to pictorial health warnings. Science 2011;333(6044):822. Available from: http://www.sciencemag.org/content/333/6044/822.1.short

63. Mir H, Buchanan D, Gilmore A, McKee M, Yusuf S and Chow C. Cigarette pack labelling in 12 countries at different levels of economic development. Journal of Public Health Policy 2011;32(2):146-64. Available from: http://www.palgrave-journals.com/jphp/journal/vaop/ncurrent/full/jphp20113a.html

64. Rommel C. The final warnings. World Tobacco 2006(203):2.

Recent references

Cameron, L.D., J.K. Pepper, and N.T. Brewer, Responses of young adults to graphic warning labels for cigarette packages. Tobacco Control, 2013.Available from: http://tobaccocontrol.bmj.com/content/early/2013/04/25/tobaccocontrol-2012-050645.abstract

Thomson, G., Wilson, N., and Maubach, N., Switch to large pictorial health warnings on cigarette packs. BMJ, 2013. **346**: p. f2084. Available from: http://www.bmj.com/content/346/bmj.f2084.pdf%2Bhtml http://www.ncbi.nlm.nih.gov/pubmed/23575927

University of Granada, Warning images for cigarette packs do not make a strong enough emotional impact, in MedicalXPress 2013.Available from: http://medicalxpress.com/news/2013-05-images-cigarette-strong-emotional-impact.html

Report of efficacy of new warnings proposed for EU

http://medicalxpress.com/news/2013-05-images-cigarette-strong-emotional-impact.html

Timea Reka Partos, Ron Borland, Hua-H Yong, James Thrasher, David Hammond. Cigarette packet warning labels can prevent relapse: findings from the International Tobacco Control 4-Country policy evaluation cohort study. Tob Control 2013;**22** e43-e50 http://tobaccocontrol.bmj.com/cgi/content/abstract/22/e1/e43?etoc

James F Thrasher, Nandita Murukutla, Rosaura Perez-Hernandez, Jorge Alday, Edna Arillo-Santillan, Claudia Cedillo, Juan Pablo Gutierrez. Linking mass media campaigns to pictorial warning labels on cigarette packages: a cross-sectional study to evaluate effects among Mexican smokers. Tob Control 2013;**22** e57-e65 http://tobaccocontrol.bmj.com/cgi/content/abstract/22/e1/e57?etoc

State of Evidence Review

Institute for Global Tobacco Control • October 2013

Health Warning Labels on Tobacco Products

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH
Institute for Global Tobacco Control

Produced by:
Institute for Global Tobacco Control
Johns Hopkins Bloomberg School of Public Health
2213 McElderry St., Fourth Floor
Baltimore, MD 21205 USA
www.jhsph.edu/igtc
www.globaltobaccocontrol.org

Suggested Citation:
Institute for Global Tobacco Control. State of Evidence Review: Health Warning Labels on Tobacco Products. Baltimore, MD: Johns Hopkins Bloomberg School of Public Health; October 2013.

For more information, please contact:
igtc@jhsph.edu

Health Warning Labels on Tobacco Products:

Article 11 of the World Health Organization's (WHO) Framework Convention on Tobacco Control (FCTC) focuses on packaging and labeling of tobacco products. Article 11 requires that tobacco product packaging carry health warnings that describe the harmful effects of tobacco use, and that packages also provide other relevant information to inform people about the harmful effects of tobacco products.[1] It is recommended that health warning labels on tobacco products cover a minimum of 50% of the front of the pack. The following translational document summarizes what is currently known about tobacco product warning labels and their key components. This review also presents examples of warning label design and practices from various countries, and provides a list of key resources for developing and implementing health warning labels on tobacco products (see Appendices).

What are health warning labels on tobacco products?

Health warning labels describe the harmful effects of tobacco products using text and/or pictures. The messages in the labels are intended to describe the harmful physical and psychosocial effects of using tobacco products. In the past, text-only warning labels have appeared on cigarette packages; the evidence now shows that picture-based warnings with accompanying text are more effective.[2,3] Health warning labels on tobacco product packaging are a cost-effective way to disseminate information to the public on the dangers of smoking and benefits of quitting. Health warning messages appear most widely and consistently on manufactured cigarette packs.[3] Other types of tobacco products, such as cigars or smokeless tobacco, may have different warnings and regulations.

Why should health warning labels be used?

Warning labels serve two main purposes. First, the warnings provide health information on the risks of using tobacco products. Although it is widely known that tobacco products are harmful, many people are not aware of the full range of negative effects they can have on health.[4,5] Second, warning labels on tobacco products aim to affect product use. This includes reducing use or encouraging quitting among users, preventing non-users from initiating, and preventing former users from relapse.

How effective are health warning labels?

There is extensive evidence to show that health warning labels on smoked tobacco products work in the following ways.

- Increase health knowledge about the harms of tobacco[4,6]
- Prevent relapse in former smokers[7]
- Deter youth and adults from initiating use and experimentation[8-10]
- Deter smokers from having a cigarette when they are about to have one [11]
- Increase smokers' intentions and attempts to quit[12,13]
- Reduce appeal of the cigarette pack[14,15]
- Promote use of quit resources[16]

Where have health warning labels on tobacco products been implemented?

As of March 2013, 64 countries/jurisdictions required or were finalizing implementation of picture-based warning labels on cigarette packs.[17] A 2012 report on the international status of package health warnings showed that 135 countries/jurisdictions did not require picture-based warnings.[18] Appendices A and B at the end of this document provide examples of countries that have implemented warning labels.

What needs to be considered when designing, developing, and implementing health warning labels?

The following section will provide details about the various components of health warning labels on tobacco products, and current evidence of their adoption and effectiveness in reducing tobacco use. Key points are highlighted below, and addressed in more detail throughout the remainder of this section.

Key points on warning label design, content, and implementation

Physical design components	Message content	Implementation and delivery
Picture-based messages are the most effective element of health warning labels on tobacco products	Messages that portray the risks of tobacco use and negative health impacts are meant to appeal to fear or emotion, and capture viewers' attention	Standardized or "plain" packaging currently exists only in Australia; standardized packaging makes warning labels more noticeable
Labels should cover at least 50% of the package surface, and text should be large and visible	Labels that include coping information such as quit resources are noticed by smokers	Frequent rotation of label pictures, content, and layout can prevent message fatigue or apathy
Labels are most noticeable on the front panel and upper portions of the pack	Coping information combined with fear-based or threatening messages enhances overall effectiveness of the warning	A set of messages using several approaches is more effective than a single, broad message
Large font and text that contrasts with the background color attracts more attention and is easier to read	Experts recommend pre-testing messages as a means of reaching specific audiences	Mass-media campaigns reinforce warning label messages

Article 11 specifies that warning labels and messages on tobacco products must be "large, clear, visible, and legible."[1] These characteristics are essential because with increased regulation of tobacco advertising, promotion, and sponsorship, tobacco companies have placed greater attention on product packaging as a marketing strategy. The pack itself now serves as a primary means of promoting tobacco products, and design elements of the pack such as shape and coloring may also be used to detract from health warning messages displayed on the package.[19]

Physical design elements

Picture-based warnings: Picture-based warnings feature an image and accompanying text containing information on the harms of tobacco use. The use of pictures greatly increases the effectiveness of health warnings on tobacco products,[3] and more countries are now incorporating pictures into their warnings. Pictures are effective because they catch and hold the viewer's attention.[20] A study of adolescent response to UK cigarette package warning labels found that the text-only warnings that appeared on the back of packages had less than 1% recall rate.[21] Use of pictures in health information is also important for reaching low-literacy individuals.[22] The current literature focuses primarily on the use of photographic picture warnings, as opposed to illustrations or cartoons. Although cartoons such as Joe Camel have been used by tobacco companies for the promotion of products, recent research on the proposed U.S. warnings showed that both youth and adults perceived labels that featured real people to be more effective than those using comic book style images.[23]

Size of the warning label: Article 11 requires that warning messages cover no less than 30 percent of the pack, but recommends at least 50 percent coverage. Larger warnings are easier to see and read, and research shows that greater coverage will incrementally increase the impact of the warning.[24,25] A 1999 study for the Canadian Cancer Society found that among four test warning labels of different size, the largest option (which covered more than 50% of the surface) was rated by subjects as most likely to discourage people from smoking.[26] Findings from a 2011 study indicated that U.S. consumers perceived larger warnings as more effective in communicating risk.[27] Countries including Uruguay and Australia have the largest size standards: 80 percent or more on both the front and back of the tobacco packaging. As of August, 2013, 46 countries that ratified the FCTC have implemented policies requiring that health warnings comprise at least 50 percent of the tobacco product packaging.

Location of the warning label on the pack: Early research on warning labels in New Zealand showed that people were more likely to recognize and remember warnings that are placed on the front of the package instead of the side.[28] Warnings located inside the pack lid were also perceived as effective. Although this particular study did not find a difference between viewer preferences for warnings on the top or bottom portion of the package, 2008 Guidelines on Article 11 state that they must appear at the uppermost parts of the pack.[29] This positioning of warning labels takes away space on the packaging that tobacco companies are known to highlight for brand promotion and advertising.[30]

Three examples of physical design approaches to warning labels on cigarette packs. All are picture-based, the label comprises at least 50% of either the front or back panel. Top: 2013 Brazil, back. Middle: 2012 Canada, front (credit: www.tobaccolabels.ca). Bottom: 2011 Thailand, front.

Color use in warning labels: The use of color increases the likelihood that an advertisement will be seen or read.[31] Text color that contrasts with the background, generally dark letters on light background, is also recommended.[32] This use of text color is known as a "contrast principle" in marketing psychology, and is important in print advertising for legibility and readability.[31] High-legibility combinations of color include black on yellow, green on white, blue on white, white on blue, and black on white. The use of an outline or border around the warning area, as opposed to "unboxed" warnings, was preferred by viewers in testing of earlier versions of warning labels in New Zealand.[28]

Text warning font: Health literacy experts recommend that text be adjacent to pictures in order to enhance understanding.[33] Large font size is helpful for readability of warning labels, and experts use size 12 fonts as a minimum standard. Although many current warning labels on tobacco products use all capitalized text, literacy experts recommend that longer headlines and body text be in lowercase type to ease readability. However, there is no evidence as to whether these same standards would be relevant to non-Roman alphabets.

Message content and style

The following section describes various approaches to developing and presenting message content in tobacco warning label messages, and discusses what is known about their effectiveness. A set of messages that incorporate several of these approaches will have a wider reach than a single message intended to reach an entire population.

Emotional appeals: Messages that appeal to negative emotions are a common approach to communicating health risks. These types of warnings appear on health warning labels on tobacco products as vivid pictures and captions that may be shocking, threatening, or unpleasant to viewers. There is reliable evidence that warning labels invoking negative emotions are effective for multiple audiences: gruesome picture warnings in the UK were found to be persuasive and credible for both adolescent non-smokers and experimental smokers.[21] A study of eye movement across warning labels found that threatening or fear arousing elements in picture warnings were salient among young adult non-smokers.[34] Pictures that feature the negative aesthetic results of smoking, for example mouth disease or skin aging, may help deter smoking among female youth.[3,35] Some emotional appeals may intend to depict a sense of sadness or suffering,[3] but the literature focuses primarily on fear-based appeals.

self-efficacy or motivational information must be integrated into threatening picture warnings to enhance effectiveness

Research suggests that smokers suppress or ignore gruesome picture warnings as a defensive response.[21,36] However, avoidance does not mean that smokers are unaffected by these warnings that invoke negative emotions; on the contrary, studies have shown that the increased presence of thoughts around the warning and its negative portrayal of tobacco use have an impact on smokers.[37,38] A series of studies conducted among U.S. and Canadian adult and young adult smokers in 2006 found that the use of gruesome pictures in warning messages increased negative affective responses, decreased pack attractiveness, increased intentions to quit, and increased perceptions of the label's ability to encourage others to quit.[6] The combination of pictures and text were also rated as more effective by viewers than text-only warnings; a subsequent study of warning label design impact on U.S. adult smokers and non-smokers had similar results.[27] Additional research has found that gruesome images in warning labels improve smokers' recall of warning content and health risks,[20] and increase quit intentions or attempts.[14,15] A single study conducted in 2013 found that presenting fear-arousing warning messages as questions rather than statements increased smokers' perceptions of smoking health risk and reduced defensive responses.[39]

Self-efficacy appeals: Additional elements such as self-efficacy or motivational information must be integrated into threatening picture warnings to enhance effectiveness among smokers.[40] A 2013 U.S.-based study found that inclusion of a hotline for quitting increased perceptions of picture-based warning label effectiveness among youth and adult smokers, while other evidence showed that smokers fixate longer on the portion of the warning that is focused on coping and quit information.[20,23] The use of self-efficacy as a counterpart to fear-inducing messages is also supported from a theoretical perspective in health behavior research.[38,41,42] In all of these studies, it is important to consider that the text was studied as part of a picture-based message, thus the results do not imply that text-only warnings should be used as an alternative. The picture is still the element that captures viewers' attention, accommodates low literacy audiences, and discourages non-smokers from initiating tobacco use.[3,20,22]

Gain/loss framing: Message content in health warning labels on tobacco products also use a technique known as gain and loss-framing. Gain-framed messages focus on the positive outcomes of the behavior, such as improved health (positive outcome) after quitting smoking (behavior); loss-framed messages focus on the negative consequences, such as the addictiveness of smoking.[43]

Left: Example of a gain-framed message on a 2012 Australian label; Right: example of a loss-framed message on a 2012 Canadian label (credits: www.tobaccolabels.ca).

Gain-framed messages often focus on encouraging smokers to quit, but we know that in general, positive-themed messages are less effective and less likely to be remembered by viewers.[3] A study of the impact of pack and warning design on U.S. smokers and non-smokers found that loss-framed messages were most effective at communicating health risk,[27] while a study of message framing among adolescents in Canada found that smokers and non-smokers were more likely to avoid smoking after viewing loss-framed messages.[43] Warnings that pertain to the negative effect of tobacco use on quality of life rather than mortality, such as impotence or premature aging, were also found to be effective among adolescents.[3] Tailoring the message to demographics such as age, gender, smoking status, and attitudes toward quitting may vary by country and culture; therefore use of several warnings with different message themes may reach a more diverse consumer base.[44]

Social value appeals: Tobacco warning labels can affect perceptions of social values and norms, and strongly influence a smoker's behavior and attitude toward quitting.[44] Social norms likely influence the impact of warnings,[3] and research suggests that health behavior is also strongly influenced by social norms and social approval.[44] The literature discusses the concept of "tobacco denormalization," or reducing the social acceptability of smoking: most smokers are aware that others disapprove of smoking and express distrust toward tobacco companies, and health warning labels have been shown to reinforce these perceptions.[45]

When developing messages that influence social norms, the viewer must find the message credible and be able to relate to it. For example, pictures that include the name of the individual portrayed or a personal narrative testimonial may make the message more relatable.[23] Other approaches to social value warning messages include depicting referent groups such as children, family, and friends. A study of Mexican adult and young adult smokers and non-smokers found that in general, testimonial narrative was perceived as less credible and relevant by viewers than a didactic, instructive text warning.[46] However, narrative testimonial was perceived as more effective among participants with lower educational status, thus the decision of which approach to use depends on the target population.

Left: 2012 Swiss/EU label portraying the negative effects of smoking on children, using a didactic message style (translation: "Protect children: don't make them breathe your smoke". Right: 2012 Canadian label that features a personal testimony (credits: www.tobaccolabels.ca)

Literacy level of warning messages: Literacy is an essential factor to consider when developing the content of health messages on tobacco products. If the literacy level of the written portion of the message is too high, the message will not have the desired effect. For example, warnings in the US have typically required a college-level reading comprehension,[47] which means the message may not reach children or adolescent viewers, or groups with low education. Literacy experts in the U.S. recommend that health information be written no higher than at a fifth grade level,[33] but this standard may not apply to other countries. It is therefore advisable to know the country or jurisdiction's literacy rates when developing the text portion of warning labels. If the literacy rates are unknown or unreliable, pre-testing may also help determine readability. Most importantly, greater size and emphasis on the picture portion of the label will reach more people regardless of audience literacy.

Implementation and delivery

Plain and standardized packaging: Plain packaging is defined as the removal of color, brand imagery, corporate logos, trademarks, and other surface elements in a tobacco package design.[48] This approach incorporates nearly all of the elements discussed in this review. Subsequent literature expands the concept of plain packaging to include standardization of the package shape, opening, and dimensions.[49] Research shows that plain and standardized packaging has several benefits, including enhancing the effectiveness of warning labels, reducing false perceptions of tobacco use, and reducing brand appeal.[48] The inclusion of picture-based warning labels as part of the plain package design may also prevent smoking among adolescents.[50] Evidence shows that the pack itself can serve as a means to impact brand appeal or attractiveness, consumer perceptions about the product quality, and can detract from health warnings.[48,49] Therefore, standardizing the shape, opening, and dimensions of the package must be considered because even with restrictions on the surface design, tobacco companies can manipulate the physical shape and size of a cigarette pack to their advantage. For example, a warning label may be distorted or difficult to read if it appears on a package that is narrow or "slim."

To date, Australia is the only country that has implemented plain and standardized packaging, though legislation was recently approved in Ireland.[51] Many other countries are considering plain or standardized packaging, including New Zealand, India, the United Kingdom, Norway, and Canada.

2013 Australian cigarette package, plain and standardized. Top: front panel. Bottom: back panel.

Rotation of warning labels: Countries and jurisdictions that are parties to the FCTC are required to rotate the health warnings that appear on tobacco product packaging. Research shows that repeated exposure to the same message over a long period eventually decreases its effectiveness and can cause viewers to feel apathetic toward the message itself. This effect of overexposure is also called "wear-out" or "message fatigue."[44] Appendix B shows various approaches to rotation plans from different countries.

The number of different labels used during a given period of time is referred to as a "set." An evidence-based toolkit on implementing health warning labels on tobacco products suggests that a set have between 8 and 12 individual warnings that appear concurrently.[30] When implementing rotation cycles, experts recommend at least every one to two years, and no more than every four years. The 2008 Guidelines to implementing Article 11 suggest alternating at least two sets of warnings and messages every 12 to 36 months.[29] The guidelines also suggest changing the layout and design of health warning labels as a less expensive approach.

Audience segmentation: Specific messages may be more salient to one group than another, or may resonate differently by country or culture. We also know that among smokers, the effectiveness of a warning message largely depends on the individual's intention or stage of readiness to quit.[52,53] The literature supports thorough pretesting of messages to help determine which strategies are most effective for a particular audience.[54] A guide to pre-testing is also available through the Key Resources list (Appendix C). In addition to pre-testing, careful planning and development of multiple warning labels will reach a wide base of consumers, while still allowing variety between warning messages to reach specific sub-groups. Just as the tobacco industry targets products to certain groups, health warning messages can be tailored for specific audiences. For example, messages focused on the negative aesthetic effects of smoking, such as rotting teeth and gums, have been shown to be effective among young people.[3]

repeated exposure to the same message over a long period eventually decreases its effectiveness

The health behavior and communication literature suggests looking for commonalities and using messages that focus on shared beliefs and behaviors to avoid the risk of stigmatization of a particular group.[55] It also suggests that race-based segmentation may be an inefficient use of resources in a campaign. Indeed, a study of picture-based health warning labels found that their impact did not significantly differ by race of the viewer.[56]

Mass media campaigns: Mass-media campaigns can be used to support, extend or reinforce health warning messages on tobacco products; this type of approach will reinforce tobacco control messages and non-smoking norms.[44] A 2011 study found that participants had higher awareness of smoking-related health effects that were mentioned in both pack warnings and on television than if health effects appeared only on the packs.[57] Exposure to mass media campaigns may also help recent quitters avoid relapse.[58]

Examples of health warning labels that target specific audiences. Left: Brazil 2013 warning label that may be targeted at men. Right: 2012 Ukraine warning label that may be targeted at young adult women.

Other Health Warnings on Tobacco Packaging

Constituents and emissions information: FCTC Article 11 states that in addition to health warning labels, information on the chemical constituents and emissions of the tobacco product must be included.[1] In addition, Article 11 Guidelines specify that "relevant qualitative statements" about the emissions of the product be displayed on the package.[29] Currently, most countries print the level of emissions on the side of packages in numerical form; however, the literature supports the use of non-numerical, descriptive labels to convey the information. Smokers and non-smokers may draw false inferences about the relative risk of cigarette brands based on emission numbers provided on the labels.[59] Accordingly, research shows that low numeracy (one's ability to comprehend, use, and attach meaning to numbers) impairs risk communication and perception.[60] Australia's current emission labels, which use descriptive statements instead of numbers, were rated easiest to understand when compared to numerical labels from the EU and Canada.[59] These findings are generally consistent with other research, showing that consumers interpret tar and nicotine numbers as indicators of risk, and believe that brands with lower yields are less harmful.[27,61,62]

Warning labels on other types of tobacco products: We know that knowledge about the harms of tobacco products other than cigarettes is lacking.[7] Many countries require warning labels on smokeless tobacco products,[63] but there is little known about their impact on perceptions and behavior. A 2011 review of health warning labels on tobacco products cited only two studies on the effectiveness of non-cigarette warnings:[3] one of the studies took place over 20 years ago, and found that small text warnings were unlikely to be effective among U.S. youth;[64] the second study, published in 2012, found that picture-based warnings on smokeless products affected Canadian young adults' perceptions and lowered intentions to use them.[65] Subsequent literature calls for further research and expansion of tobacco control laws in other non-Western countries where smokeless tobacco use is a large concern.[66,67] A 2009 toolkit for FCTC Article 11 implementation states that adaptations may be made for non-manufactured cigarettes.[30] Separate health warnings and display constituent information may be necessary for other products such as smokeless tobacco, but there is little evidence of best practices in designing or adapting labels for this type of packaging.

Left: Tobacco and lime smokeless product, Pakistan. Right: Betel nut, tobacco and lime smokeless product, India

Needs for further evidence

There is a lack of evidence on the following aspects of health warning labels on tobacco product packaging:

- The most effective approaches to message content (such as fear appeals, gain vs. loss-framing) for either reducing tobacco use, changing perceptions, increasing knowledge, or discouraging initiation
- The optimum rotation cycle and set size for preventing message fatigue
- The potential interaction between various design elements of warning labels, such as size and location
- The long-term behavioral outcomes after health warning label implementation, such as quit attempts and sustained quits over long periods of time
- The effect of new tobacco industry marketing tactics such as promotional inserts or "outserts" (attachments on the outside of the pack) on consumers, and how tobacco control efforts should respond to these tactics
- The effectiveness of descriptive statements compared to numerical information in conveying the levels of constituents and emissions in tobacco products
- The effectiveness of adapting existing health warning labels for cigarettes for other types of tobacco products such as smokeless tobacco or hookah, versus creating separate sets of warnings

Conclusion

The evidence on health warning labels on tobacco product packaging is extensive. To summarize, we know that warnings are effective when they use large pictures with accompanying text—the larger the label, the better. Periodically rotating labels in sets prevents message fatigue, though there is no standard on the optimum number in a set or rotation period. We have an overall understanding of the types of messages that are effective in warning labels, such as emotional appeals, but pre-testing is critical to ensure that sub-groups in a population are receiving these messages as intended. More research and policy are needed for warning labels on tobacco products other than cigarettes. Much of the evidence on longer-term impact of warning labels on smoking prevalence, quit attempts, and other smoking-related behaviors comes from research in Canada and Australia; this is because these countries were early adopters of picture-based warning labels on tobacco products. As more low and middle income countries implement similar policies, research findings in these areas will enrich the evidence on effective health warning labels.

References

1. World Health Organization. WHO Framework Convention on Tobacco Control, Article 11: Packaging and labeling of tobacco products. 2003:9-10. WHO Document Production Services, Geneva, Switzerland.
2. The International Tobacco Control Policy Evaluation Project (ITC). Health warnings on tobacco packages: ITC cross-country comparison report. 2012. University of Waterloo, Waterloo, Ontario, Canada. http://www.itcproject.org/documents/keyfindings/crosscountry-comparisons/itc-crosscountrylabelfinalwebpdf
3. Hammond D. Health warning messages on tobacco products: A review. Tob Control. 2011;20(1):327-337.
4. Kennedy RD, Spafford MM, Behm I, Hammond D, Fong GT, Borland R. Positive impact of Australian 'blindness' tobacco warning labels: Findings from the ITC four country survey. Clin Exp Optom. 2012;95(6):590-598.
5. O'Connor RJ, McNeill A, Borland R, et al. Smokers' beliefs about the relative safety of other tobacco products: Findings from the ITC collaboration. Nicotine Tob Res. 2007;9(10):1033-1042.
6. Hammond D, Fong GT, McNeill A, Borland R, Cummings KM. Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: Findings from the International Tobacco Control (ITC) four country survey. Tob Control. 2006;15 Suppl 3:iii19-25.
7. Partos TR, Borland R, Yong HH, Thrasher J, Hammond D. Cigarette packet warning labels can prevent relapse: Findings from the International Tobacco Control 4-country policy evaluation cohort study. Tob Control. 2013;22(e1):e43-50.
8. Shanahan P, Elliott D. Evaluation of the effectiveness of the graphic health warnings on tobacco product packaging 2008. 2009. Australian Government Department of Health and Ageing, Canberra.
9. White V, Webster B, Wakefield M. Do graphic health warning labels have an impact on adolescents' smoking-related beliefs and behaviours? Addiction. 2008;103(9):1562-1571.
10. European Commission. Eurobarometer: Survey on tobacco (analytical report). 2009. http://ec.europa.eu/public_opinion/flash/fl_253_en.pdf
11. 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):202-209.
12. 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):391-395.
13. Azagba S, Sharaf MF. The effect of graphic cigarette warning labels on smoking behavior: Evidence from the Canadian experience. Nicotine Tob Res. 2013;15(3):708-717.
14. Hoek J, Wong C, Gendall P, Louviere J, Cong K. Effects of dissuasive packaging on young adult smokers. Tob Control. 2011;20(3):183-188.
15. Kees J, Burton S, Andrews JC, Kozup J. Tests of graphic visuals and cigarette package warning combinations: Implications for the Framework Convention on Tobacco Control. Journal of Public Policy and Marketing. 2006;25(2):212-223.
16. Li J, Grigg M. New Zealand: New graphic warnings encourage registrations with the quitline. Tob Control. 2009;18(1):72.
17. Riordan M. Tobacco warning labels: Evidence of effectiveness. March 2013. Campaign for Tobacco Free Kids. www.tobaccofreekids.org/research/factsheets/pdf/0325.pdf
18. Canadian Cancer Society. Cigarette package health warnings: International status report. October 2012; 3rd ed. http://global.tobaccofreekids.org/files/pdfs/en/WL_status_report_en.pdf Accessed July 2013.
19. Borland R, Savvas S, Sharkie F, Moore K. The impact of structural packaging design on young adult smokers' perceptions of tobacco products. Tob Control. 2013;22(2):97-102.

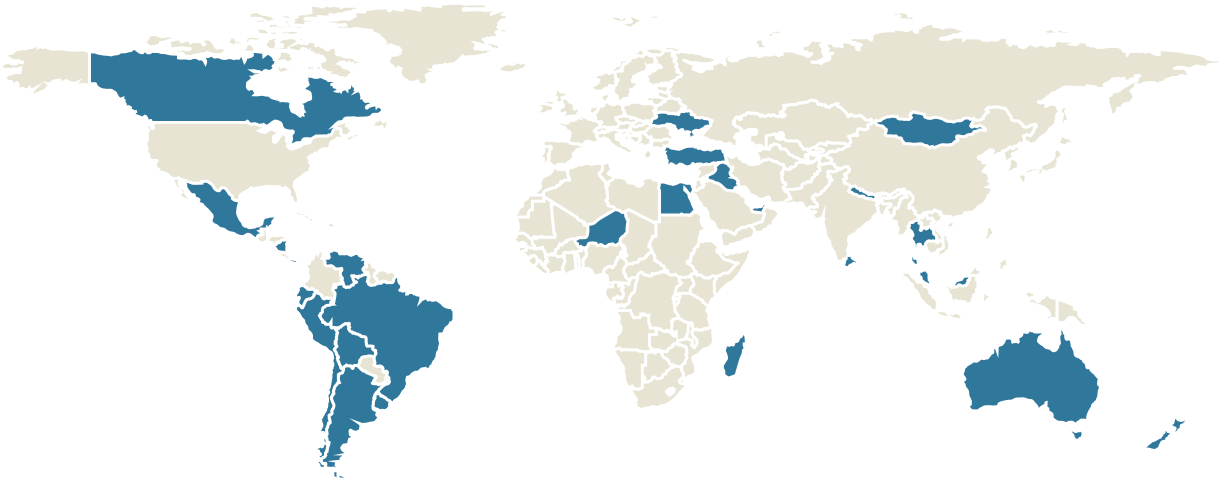
20. Strasser AA, Tang KZ, Romer D, Jepson C, Cappella JN. Graphic warning labels in cigarette advertisements: Recall and viewing patterns. Am J Prev Med. 2012;43(1):41-47.
21. Moodie C, Mackintosh AM, Hastings G. Adolescents' response to pictorial warnings on the reverse panel of cigarette packs: A repeat cross-sectional study. Tob Control. Published Online First: September 4, 2013 doi:10.1136/tobaccocontrol-2013-050999.
22. Shieh C, Hosei B. Printed health information materials: Evaluation of readability and suitability. J Community Health Nurs. 2008;25(2):73-90.
23. Hammond D, Reid JL, Driezen P, Boudreau C. Pictorial health warnings on cigarette packs in the United States: An experimental evaluation of the proposed FDA warnings. Nicotine Tob Res. 2013;15(1):93-102.
24. Les Études de Marché Créatec+. Quantitative study of Canadian adult smokers: Effects of modified packaging through increasing the size of warnings on cigarette packages. Prepared for Health Canada. April 2008. http://www.smoke-free.ca/warnings/WarningsResearch/modified%20packaging%20-%20report-adult.pdf
25. Les Études de Marché Créatec+. Quantitative study of Canadian youth smokers and vulnerable non-smokers: Effects of modified packaging through increasing the size of warnings on cigarette packages. Prepared for Health Canada. April 2008. http://www.smoke-free.ca/warnings/WarningsResearch/report-modified%20packaging-youth.pdf
26. Environics Research Group Ltd. Reactions to cigarette packaging formats. Prepared for the Canadian Cancer Society, Focus Canada 1999-1. March 1999. http://legacy.library.ucsf.edu/tid/odl70g00/pdf
27. Bansal-Travers M, Hammond D, Smith P, Cummings KM. The impact of cigarette pack design, descriptors, and warning labels on risk perception in the U.S. Am J Prev Med. 2011;40(6):674-682.
28. AGB Spectrum Research Ltd. Testing the positions of health warnings on cigarette packages. Prepared for Health Promotion Programme, Department of Health, New Zealand. 1987. http://legacy.library.ucsf.edu/documentStore/l/e/l/lel70g00/Slel70g00.pdf
29. World Health Organization. Guidelines on packaging and labeling of tobacco products. WHO | Guidelines for implementation of Article 11 Web site. http://www.who.int/fctc/guidelines/article_11.pdf. Updated November 2008. Accessed August, 2013.
30. Hammond D. Tobacco labelling and packaging toolkit: A guide to FCTC article 11. 2009; University of Waterloo, Canada. http://www.tobaccolabels.ca/healt/resources/2009labelling packagingtoolkitarticle-11guidepdf
31. Schindler PS. Color and contrast in magazine advertising. Psychology & Marketing. 1986;3(2):69-78.
32. Nilsson T. Legibility of tobacco health messages with respect to distance: A report to the Tobacco Products Division of the Health Protection Branch of Health and Welfare Canada. 1991. http://legacy.library.ucsf.edu/documentStore/z/b/l/zbl70g00/Szbl70g00.pdf
33. Doak C, Doak L, Root J. Teaching patients with low literacy skills. 2nd ed. Philadelphia, PA: J.B. Lippincott Company. 1996.
34. Kessels LT, Ruiter RA. Eye movement responses to health messages on cigarette packages. BMC Public Health. 2012;12(1):352-360.
35. Elliott & Shanahan (E&S) Research. Developmental research for new Australian health warnings on tobacco products: Stage 1. 2002. Prepared for the Population Health Division Department of Health and Ageing.
36. Kessels LT, Ruiter RA, Jansma BM. Increased attention but more efficient disengagement: Neuroscientific evidence for defensive processing of threatening health information. Health Psychol. 2010;29(4):346-354.
37. Hammond D, Fong GT, McDonald PW, Brown KS, Cameron R. Graphic Canadian cigarette warning labels and adverse outcomes: Evidence from Canadian smokers. Am J Public Health. 2004;94(8):1442-1445.
38. Peters GJ, Ruiter RA, Kok G. Threatening communication: A critical re-analysis and a revised meta-analytic test of fear appeal theory. Health Psychol Rev. 2013;7(Suppl 1):S8-S31.

39. Glock S, Muller BC, Ritter SM. Warning labels formulated as questions positively influence smoking-related risk perception. J Health Psychol. 2013;18(2):252-262.
40. Gallopel-Morvan K, Gabriel P, Le Gall-Ely M, Rieunier S, Urien B. The use of visual warnings in social marketing: The case of tobacco. Journal of Business Research. 2011;64(1):7-11.
41. Rimal RN. Perceived risk and self-efficacy as motivators: Understanding individuals' long term use of health information. J Commun. 2001;51(4):633-654.
42. Hansen J, Winzeler S, Topolinski S. When the death makes you smoke: A terror management perspective on the effectiveness of cigarette on-pack warnings. J Exp Soc Psychol. 2010;46(1):226-228.
43. Goodall C, Appiah O. Adolescents' perceptions of Canadian cigarette package warning labels: Investigating the effects of message framing. Health Commun. 2008;23(2):117-127.
44. Strahan EJ, White K, Fong GT, Fabrigar LR, Zanna MP, Cameron R. Enhancing the effectiveness of tobacco package warning labels: A social psychological perspective. Tob Control. 2002;11(3):183-190.
45. Hammond D, Fong GT, Zanna MP, Thrasher JF, Borland R. Tobacco denormalization and industry beliefs among smokers from four countries. Am J Prev Med. 2006;31(3):225-232.
46. Thrasher JF, Arillo-Santillán E, Villalobos V, et al. Can pictorial warning labels on cigarette packages address smoking-related health disparities? Field experiments in Mexico to assess pictorial warning label content. Cancer Causes Control. 2012;23 Suppl 1:69-80.
47. Malouff J, Gabrilowitz D, Schutte N. Readability of health warnings on alcohol and tobacco products. Am J Public Health. 1992;82(3):464-466.
48. Hammond D. "Plain packaging" regulations for tobacco products: The impact of standardizing the color and design of cigarette packs. Salud Publica Mex. 2010;52 Suppl 2:S226-S232.
49. Kotnowski K, Hammond D. The impact of cigarette pack shape, size and opening: Evidence from tobacco company documents. Addiction. 2013;108(9):1658-1668.
50. McCool J, Webb L, Cameron LD, Hoek J. Graphic warning labels on plain cigarette packs: Will they make a difference to adolescents? Soc Sci Med. 2012;74(8):1269-1273.
51. Department of Health Ireland. Ireland set to become second country in the world to introduce plain pack cigarettes (Press release). May 2013. http://www.dohc.ie/press releases/2013/20130528.html
52. Cho H, Salmon CT. Fear appeals for individuals in different stages of change: Intended and unintended effects and implications on public health campaigns. Health Commun. 2006;20(1):91-99.
53. Wong NC, Cappella JN. Antismoking threat and efficacy appeals: Effects on smoking cessation intentions for smokers with low and high readiness to quit. J Appl Commun Res. 2009;37(1):1-20.
54. Devlin E, Anderson S, Hastings G, Macfadyen L. Targeting smokers via tobacco product labelling: Opportunities and challenges for Pan European health promotion. Health Promot Int. 2005;20(1):41-49.
55. Hornik RC, Ramirez AS. Racial/ethnic disparities and segmentation in communication campaigns. Am Behav Sci. 2006;49(6):868-884.
56. Thrasher JF, Carpenter MJ, Andrews JO, et al. Cigarette warning label policy alternatives and smoking-related health disparities. Am J Prev Med. 2012;43(6):590-600.
57. Brennan E, Durkin SJ, Cotter T, Harper T, Wakefield MA. Mass media campaigns designed to support new pictorial health warnings on cigarette packets: Evidence of a complementary relationship. Tob Control. 2011;20(6):412-418.
58. Wakefield MA, Bowe SJ, Durkin SJ, et al. Does tobacco-control mass media campaign exposure prevent relapse among recent quitters? Nicotine Tob Res. 2013;15(2):385-392.
59. Hammond D, White CM. Improper disclosure: Tobacco packaging and emission labelling

regulations. Public Health. 2012;126(7):613-619.
60. Nelson W, Reyna VF, Fagerlin A, Lipkus I, Peters E. Clinical implications of numeracy: Theory and practice. Ann Behav Med. 2008;35(3):261-274.
61. Weinstein N. Public understanding of risk and reasons for smoking low-yield products . In: Smoking and tobacco control monograph no. 13: Risks associated with smoking cigarettes with low machine-measured yields of tar and nicotine. Bethesda, MD: US Department of Health and Human Services, Public Health Services, National Institutes of Health; National Cancer Institute; 2001:193. http://legacy.library.ucsf.edu/tid/fwr10j00/pdf. Accessed September 2013.
62. O'Connor RJ, Kozlowski LT, Borland R, Hammond D, McNeill A. Relationship between constituent labelling and reporting of tar yields among smokers in four countries. J Public Health (Oxf). 2006;28(4):324-329.
63. World Health Organization. Warn about the danger of tobacco: Health warning labels on smokeless tobacco packaging by country. Global Health Observatory Data Repository Web site. http://apps.who.int/gho/data/node.main.1287. Updated 2013. Accessed August, 2013.
64. Brubaker RG, Mitby SK. Health-risk warning labels on smokeless tobacco products: Are they effective? Addict Behav. 1990;15(2):115-118.
65. Callery WE, Hammond D, O'Connor RJ, Fong GT. The appeal of smokeless tobacco products among young Canadian smokers: The impact of pictorial health warnings and relative risk messages. Nicotine Tob Res. 2011;13(5):373-383.
66. Sinha DN, Gupta PC, Ray C, Singh PK. Prevalence of smokeless tobacco use among adults in WHO South-East Asia. Indian J Cancer. 2012;49(4):342-346.
67. O'Connor RJ. Non-cigarette tobacco products: What have we learnt and where are we headed? Tob Control. 2012;21(2):181-190.

Appendices

Appendix A. Health warning labels about the dangers of tobacco - Highest achieving countries, 2012



Highest achieving country: warning labels are sufficiently large, use pictures, and include all other appropriate characteristics per FCTC Article 11.

Countries with the highest levels of achievement: Argentina*, Australia, Boliva (Plurinational State of), Brazil, Brunei Darussalam, Canada*, Chile, Djibouti, Ecuador*, Egypt, El Salvador*, Iran (Islamic Republic of), Madagascar*, Malaysia, Mauritius, Mexico, Mongolia*, Nepal*, New Zealand, Niger*, Panama, Peru, Seychelles*, Singapore, Sri Lanka*, Thailand, Turkey*, Ukraine, Uruguay and Venezuela
*Country newly at the highest level since 31 December 2010

Source: World Health Organization. WHO Report on the Global Tobacco Epidemic, 2013: Enforcing bans on tobacco advertising, promotion and sponsorship. WHO Press, Geneva, Switzerland: 2013.

Appendix B. Profiled practices of warning labels on smoked tobacco products, by country

Country	Label size, type, and layout	Current rotation plan	Other information
Bangladesh	Text-based. 30% of the front and back, appearing at the top of the surface area.	Set of 6 warnings, rotated over 6 months.	No warning label requirements exist for smokeless tobacco products.
Brazil	Picture-based. 100% of either the front or back of the package, 100% of one of the package sides.	Set of 10, rotated every 5 months.	Similar requirements exist for smokeless products. Descriptive labels on emissions and constituents appear on side panels.
China	Text-based. 30% of the pack, Chinese on the front and English on the back.	Set of 2, rotation period and cycle unknown.	Tobacco companies can design their own warning labels under specific government guidelines.
Egypt	Picture-based. 50% of the front and back of packages.	Set of 4, rotated over 6 months.	Similar warning label requirements exist for smokeless tobacco products.
India	Picture-based. 40% of front. Text portion of the warning consists of "smoking kills" or "warning".	Set of 3, rotated over 2 years.	Similar requirements exist for smokeless products, which have a set of 4 warnings over the same rotation period.

Country	Label size, type, and layout	Current rotation plan	Other information
Indonesia	Text-based. Approximately 19% of back. May be accompanied by pictures, but not required.	Set of 1, rotation not currently required.	No requirements exist for smokeless products.
Mexico	30% of the front, 100% of the back, and 100% of one side of the package. Picture-based on the front, text-based on the back and side.	Set of 4 warnings, rotated over 6 months.	Text warnings appear on the sides of smokeless products, with a similar rotation plan.
Pakistan	Picture-based. 40% of front, 40% of back-picture comprises 30%, text 10%. Must be placed on the top portion of surface.	Set of 1, rotated over 1 year.	No warning requirements exist for smokeless products.
Philippines	Text-based. 30% of front only.	Set of 4, rotated over 2 years.	Similar warning requirements exist for smokeless products. An Administrative Order for 60% coverage of the back of packages issued in 2010 has not yet taken effect.
Russia	Picture-based. 30% of front, 50% of back. Accompanying text on the front says “smoking kills”.	Set of 13, rotated no more than once per year.	Smokeless products are required to have a text-based warning that covers 30% of the front.

Country	Label size, type, and layout	Current rotation plan	Other information
Thailand	55% of the front, 55% of the back of the package. Recently added warnings to cover 60% of both side panels. Pictures with text on both sides.	Set of 10 warnings; rotation period and cycle unknown.	Warnings exist for cigar packaging and smokeless products. Descriptive labels on emissions and constituents are required.
Turkey	65% of the front, 43% of the back of the package. Picture-based.	Set of 14 rotated over 14 months.	Text warnings are required for smokeless products, covering 30% of the front of the package.
Ukraine	50% of the front, 50% of the back of the package. Primarily text-based for main display areas, pictures accompany text in secondary display areas.	Set of 11 warnings, 5 year rotation period.	Similar warnings for smokeless products. The law counts the label border as part of the 50% warning area for all health warnings.
Vietnam	Picture-based (expected November 2013). 50% of front, 50% of back.	Set of 6, rotated over 2 years.	Requirements for warnings do not distinguish between smoked and smokeless products; but details of the law only use smoked products as an example.

Sources:

1. Campaign for Tobacco-Free Kids. Legislation - Tobacco Control Laws. www.tobaccocontrollaws.org . Updated 2013. Accessed August 26, 2013.

2. World Health Organization. “Warn about the dangers of tobacco: health warning labels on smokeless tobacco packaging by country.” Global Health Observatory Data Repository. Updated 2013. http://apps.who.int/gho/data/node.main.1287. Accessed August 26, 2013.

3. Hammond D. Health Warning Images - Tobacco Labelling Regulations. Tobacco Labelling Resource Centre. Updated 2013. http://www.tobaccolabels.ca/healthwarningimages. Accessed August 6, 2013.

Appendix C. Key Resources
A list of selected print and web publications on the evidence, development, and implementation of effective health warning labels on tobacco products

Title	Description	Author(s) or Organization	Link
Tobacco Labelling and Packaging Toolkit – Guide to FCTC Article 11	A comprehensive guide that includes an evidence review, recommendations on designing, evaluating, and implementing health warning labels. (2009)	Hammond D	www.tobaccolabels.-ca/healt/resources/2009labelling-packaging-toolkitarticle-11guidepdf
Pre-testing and evaluating warning messages for tobacco products	A guide providing a basic protocol for developing and implementing health warning labels. (2011)	Hammond D, Reid J	www.tobaccolabels.-ca/healt/resources/2011pretest-ingevaluating-hwmguidepdf
Tobacco Labelling Resource Centre	A website with detailed information and images of warning labels and policy by country. (Updated 2013)	Hammond D	www.tobaccolabels.ca
Tobacco Control Laws	A website providing country labeling and packaging laws. (Updated 2013)	Campaign for Tobacco-Free Kids	www.tobaccocontrol-laws.org
Tobacco Warning Labels: Evidence of Effectiveness	A factsheet providing an overview of the evidence on health warning label effectiveness from a global perspective. (2013)	Campaign for Tobacco-Free Kids	www.tobaccofreek-ids.org/research/fact-sheets/pdf/0325.pdf

Title	Description	Author(s) or Organization	Link
Cigarette Package Health Warnings: International Status Report (3rd edition)	A general report on cigarette warning labels. Includes images, graphs, and rankings of different countries' implementation status. (2012)	Canadian Cancer Society	http://global.tobaccofreekids.org/files/pdfs/en/WL_status_report_en.pdf
Health warning messages on tobacco products: a review	A scholarly review of messages that appear on health warning labels from various countries. (2011)	Hammond D	http://tobaccocontrol.bmj.com/content/early/2011/05/23/tc.2010.037630.abstract
Enhancing the effectiveness of tobacco package warning labels: a social psychological perspective	A scholarly paper on the psychosocial theory or principle behind messages used in health warning labels. (2002)	Strahan EJ, White K, Fong GT, Fabrigar LR, Zanna MP, Cameron R	www.ncbi.nlm.nih.gov/pmc/articles/PMC1759023/pdf/v011p00183.pdf
The impact of cigarette pack shape, size and opening: evidence from tobacco company documents	A scholarly paper examining tobacco industry documents to show the importance of the package as a promotional medium for tobacco products.(2013)	Kotnowski K, Hammond D	www.ncbi.nlm.nih.gov/pubmed/23600674

Appendix D. Tobacco package warning labels from selected countries, by package panel

Bangladesh, front

Brazil, front

Brazil, back

China, front (photo credit www.tobaccolabels.ca)

India, front

Mexico, front

Mexico, back

Philippines, front

Russia, front

Russia, back

Turkey, front

Turkey, back

Ukraine, front

Ukraine, back