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Disparagement of health warning labels on cigarette packages and cessation attempts: results from four countries

Amira Osman[1]*, James F. Thrasher[2], Hua-Hie Yong[3], Edna Arillo-Santillán[4] and David Hammond[5]

[1]Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, 450 West Dr, Chapel Hill, NC 27599, USA, [2]Department of Health Promotion, Education, and Behavior, Arnold School of Public Health, University of South Carolina, 921 Assembly St, Columbia, SC 29208, USA, [3]The Cancer Council Victoria, 615 St Kilda Rd, Melbourne VIC 3004, Australia, [4]Department of Tobacco Research, Mexican National Institute of Public Health, Avenida Universidad 655, Santa MarûÙa AhuacatitlûÀn, 62100 Cuernavaca, Mor., Mexico and [5]School of Public Health and Health Systems, University of Waterloo, 200 University Ave W, Waterloo, ON N2L 3G1, Canada
*Correspondence to: A. Osman. E-mail: amirao@email.unc.edu

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Abstract

Health warning labels (HWLs) on cigarette packs that use strong fear appeals may evoke defensive responses including acts of disparaging the warnings. Whether warning disparagement undermines HWL effectiveness remains unclear. We assessed correlates of one type of HWL disparagement and its association with subsequent cessation attempts. Longitudinal data (2012–14) on adult smokers from Australia, Canada, Mexico and the United States (US) were analyzed. HWL disparagement was assessed as the frequency of making fun of HWLs in the past month. Using Generalized Estimating Equation models we estimated correlates of HWL disparagement and whether HWL disparagement predicted subsequent cessation attempts. In each country, across all waves, 24–31% of smokers reported making fun of the warnings at least once in the past month. More frequent disparagement was found among males, younger participants, those with higher education and greater addiction, and those who recently attempted to quit. Attention to, avoidance of and talking to others about HWLs were all positively associated with HWL disparagement. In all countries, except the US, this type of HWL disparagement was an independent predictor of subsequent cessation attempts. HWL disparagement among smokers may indicate greater warning relevance and processing and does not result in counterproductive effects on cessation efforts.

Introduction

Countries increasingly implement health warning labels (HWLs) on cigarette packages to disseminate information on the health risks of smoking. Graphic pictorials that accompany warning statements illustrate the health risks of tobacco use and reduce the appeal of smoking and of cigarette packaging. Observational and experimental studies have demonstrated that pictorial HWLs are more effective than text-only HWLs in attracting smokers' attention, increasing awareness of the dangers of smoking, enhancing elaboration of risk perception and promoting cessation [1–5]. Yet, graphic HWLs that use strong fear appeals may also evoke defensive reactions to the warnings and suppress desired HWL effects on behavior change.

Fear appeals, defensive reactions and behavior change

Theoretical models of persuasive communications suggest that messages with relatively stronger fear appeals result in greater changes in attitudes,

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intentions and behaviors [6–8]. As such, pictorial HWLs that use graphic imagery to illustrate the negative consequences of smoking are likely to evoke fear and negative affect related to smoking risks. Fear-arousing content, however, may also evoke defensive reactions to HWLs [8–10]. Indeed, critics of pictorial HWLs have raised the concern that graphic warnings on cigarette packs may arouse fear and anxiety rendering them ineffective, particularly among smokers who react defensively to these warnings [9, 11–14].

Defensive reactions and anti-smoking messages

Defensive reactions represent motivated resistance to the message [15] and can take many forms including defensive avoidance, reactance, derogation and disparagement of the message. Most studies on defensive responses to anti-smoking messages examined avoidance behavior, reactance and derogation of messages [16–22]. Studies of Canadian graphic HWLs, for example, found little to no evidence for defensive avoidance of graphic HWLs among smokers (defined as efforts to avoid looking or thinking about the warnings by covering or hiding the labels) [23], even when compared with US text-only HWLs [24]. Reactance (rejection of persuasive messages when one feels their freedom is threatened) [10, 25] is positively associated not only with HWLs avoidance but also with cigarette forgoing due to HWLs, and with subsequent cessation attempts among smokers from Canada, Australia, Mexico and the United States (US) [18]. Message derogation has also been examined in a few studies and has been defined as a defensive reaction that involves questioning the validity of the information in a message [26]. Hall et al. measured HWL derogation as the extent to which the warning was rated as pointless, stupid or useless and found that pictorial and text-only HWLs were as equally to elicit derogatory responses among smokers and nonsmokers in the US [19]. Other studies measured message derogation as the extent to which anti-smoking messages were rated as overblown, distorted, exaggerated or manipulative [21, 22]. Schüz and Ferguson found that smokers were more likely, to derogate anti-smoking messages but less likely to accept the message, than nonsmokers [22]. As such, smokers for whom persuasive messages about smoking are more personally relevant can be expected to derogate anti-smoking messages more than nonsmokers do.

Only one study, of which we are aware, examined message disparagement in the context of anti-smoking messages, conceptualizing disparagement as the extent to which the message was convincing or said something important to the recipient [27]. Message disparagement can be conveyed in the way individuals communicate with others about the message. Indeed, interpersonal communication about HWLs increases after new pictorial HWLs are introduced [28, 29]. Moreover, speaking to other about anti-smoking messages, including HWLs, has been shown to lead to greater message recall and to positive changes in attitudes, risk perceptions [30–32] and cessation behavior [29, 33]. Among adult smokers in Australia, Canada and Mexico, interpersonal communication about pictorial HWLs was more prevalent among smokers who intended to quit or had recently attempted to quit, suggesting that it is those who feel greater personal relevance of HWL messages who are more likely to speak to others about them [29]. Acts of disparaging anti-smoking messages, however, can go beyond mere questioning of the message believability and involve making fun of or mocking the message with the intention of depreciating or minimizing its value. The extent to which smokers disparage HWLs in the form of making fun of, joking about, or mocking them has never been examined. Given frequent, daily exposure to HWLs on cigarette packages among adult smokers, HWL disparagement in the form of mockery may be particularly high. However, it is unclear whether this is a reason for concern, as the attitudinal and behavioral consequences of this kind of HWL disparagement among smokers have not been studied.

In this study, we utilized data on smokers from four countries, three of which (i.e. Australia, Canada and Mexico) have prominent pictorial HWLs on the front and back of cigarette packs, consistent with the labeling recommendations of the World Health Organization Framework Convention on Tobacco Control [34]. The US, on the other hand, uses

small, text-only HWLs displayed on the side of cigarette packs. We assessed correlates of HWL disparagement in the form of making fun of the warning labels, including sociodemographic and smoking-related correlates. We examined the association between this form of HWL disparagement and measures of HWLs effectiveness (i.e. attention to, cognitive elaboration of risks due to HWLs, talking to others about HWLs), and other defensive reactions to HWLs (i.e. avoidance behavior). Lastly, we examined the association between this form of HWL disparagement and subsequent cessation attempts among smokers. Based on empirical findings related to other defensive responses to graphic HWLs (e.g. avoidance of HWLs, reactance) [18, 19], we hypothesize that there will be no adverse effect of HWL disparagement in the form of mockery on HWL effectiveness or cessation likelihood.

Materials and methods

Sample

We analyzed longitudinal data from an open cohort of adult smokers recruited from online consumer panels, with seven survey waves collected in Australia, Canada and Mexico, and six waves in the US. The panels were provided by Global Market Insights [35], which purposively selects participants to be representative of key consumer segments in each country. At enrollment, eligible participants were 18–64 years' old, had smoked at least 100 cigarettes in their lifetime, and smoked some days or everyday in the previous month. Participants were surveyed every 4 months between September 2012 and September 2014 (the US survey began in January 2013). Samples were replenished to maintain sample sizes of approximately 1000 participants in each country at each wave, except for the US, where 400 additional Latino smokers were oversampled at each wave (to allow comparisons with Mexico for other project aims).

Measures

HWLs disparagement. HWL disparagement was measured using a single item where participants were asked how often they had made fun of warning labels on cigarette packs in the prior month. Responses were on a five-point scale (i.e. not at all, once, a few times, often or very often). This question uses a similar in structure, time frame and response options as self-reported measures of other types of HWL responses used in observational studies across a variety of countries [4] and that show evidence of validity (see Responses to HWLs).

Reponses to HWLs

Attention to HWLs. Two items assessed attention to HWLs. Participants were asked how often, in the past month, they had: (i) noticed health warnings on cigarette packages and (ii) read or looked closely at the warning labels on cigarette packages. Responses (i.e. never, rarely, sometimes, often and very often) for the two items were averaged to create a score of attention to HWLs (range 1–5) which is the first step in processing HWLs [36].

Cognitive elaboration of risks due to HWLs. Participants were asked to what extent do HWLs: (i) make you think about the health risks of smoking; (ii) make you more likely to quit smoking and (iii) how much do the warning labels make you feel like you would be better off without smoking. Reponses for each of the three items were on a nine-point scale, ranging from 'not at all' to 'extremely' (Cronbach's alpha $> .90$ in all countries). Responses were averaged across items (1–9) with higher numbers indicating stronger cognitive elaboration of risks due to HWLs which has been shown to predict cessation attempts [20].

Interpersonal communication about HWLs. The frequency of interpersonal communication about HWLs was assessed with three items, which asked how often, in the past month, participants had: (i) talked to others about HWLs on cigarette packs; (ii) family members spoken with you about HWLs on cigarette packs; and (iii) other people besides your family spoken with you about HWLs on cigarette packs. Responses ('not at all', 'once', 'a few times', 'often', 'very often') were the same for each item, and internal consistency was good across countries (Cronbach's alpha 0.87, 0.83, 0.81 and 0.91 in

Australia, Canada, Mexico and the US, respectively). Hence, responses were summed (range 1–15), and because of skewed distributions, were re-categorized into low (1–3), moderate (4–6) and high (7–15) to establish the most uniform distribution possible across countries as in prior studies, where interpersonal communication has been shown to increase after policy change and to predict future cessation attempts [29, 37].

Avoidance of HWLs. Participants were asked whether, in the past month, they have made any effort to avoid looking at or thinking about the warning labels—such as covering them up, keeping them out of sight, using a cigarette case, avoiding certain warnings or any other means (yes = 1 versus no = 0) which has been shown to be positively associated with reactance and, in some studies, with cessation attempts [18, 20].

Cessation attempts. At each wave, participants were asked whether they had made a quit attempt in the past 4 months (yes = 1 versus no = 0) and how long their last quit attempt lasted. In follow-up waves, participants were also asked whether they were quit at the time of the follow-up survey and how long had they been quit for. The primary outcome, cessation attempt, was defined as any smokers at wave T who reported making at least one quit attempt or who were quit at wave T + 1. Additionally, for each participant we derived a 24-hour abstinence variable at time T + 1 (Yes, No) which was used as the outcome cessation variable in a sensitivity analysis (See Sensitivity analysis section).

Covariates. Sociodemographic factors included age (18–24; 25–34; 35–44; 45–54; 55–64), sex, education (high school or less; college or some university; completed university or higher) and income (i.e. annual income $29 999 or less; $30 000–59 999; $60 000 or more in Australia, Canada and the US; and monthly income $10 000 or less; $10 001–$20 000; $20 001 or more in Mexico). Smoking-related variables included: intention to quit smoking within the next 6 months (yes = 1 versus no = 0); having made a quit attempt in the prior 4 months (yes = 1 versus no = 0); a dichotomous indicator of daily versus non-daily smoking, and the Heaviness of Smoking Index (HSI), which combined average cigarettes per day and time to first cigarette (range 0–6) [38]. To adjust for temporal trends, we included survey wave as a control variable, with the baseline survey wave as the reference category (i.e. wave 1 for Australia, Canada and Mexico; wave 2 for the US). Finally, to adjust for potential instrumentation effects from prior participation in the study, a variable was created to indicate the number of prior surveys to which the participant had responded (range 1–7 for Australia, Canada and Mexico, and 1–6 for the US), with a higher number indicating more time in the sample.

Statistical analysis

For each country we derived an analytic sample of participants for whom there was no missing data on any of the variables included in this analysis. Also, participants who reported being quit at time T were excluded because they did not respond to HWLs-related questions (Fig. 1). Due to unknown differences in sample recruitment and the sampling frames used across countries, all models were stratified by country. When regressing 'HWL disparagement' on covariates (i.e. sociodemographics, smoking-related variables, survey variables), it was treated as a count outcome variable (range 1–5) and country-specific Poisson Generalized Estimating Equation (GEE) models were estimated. In a separate set of models, HWL disparagement was regressed on smokers' responses to HWLs (i.e. attention, cognitive elaboration of risks due to HWLs, interpersonal communication about HWLs and avoidance), estimating both bivariate (unadjusted) and multivariable (adjusted) associations separately for each of these HWL responses, while controlling for covariates. We report incidence rate ratios (IRRs) and their associated 95% confidence intervals (CIs).

In the next set of analyses, due to small sample sizes in the response options indicating most frequent disparagement in the prior month (see Table I), participants were classified into three categories (no disparagement; once; few times or more). Then, country-specific logistic GEE models were estimated regressing quit attempt at time T + 1 on the frequency of HWL disparagement at time

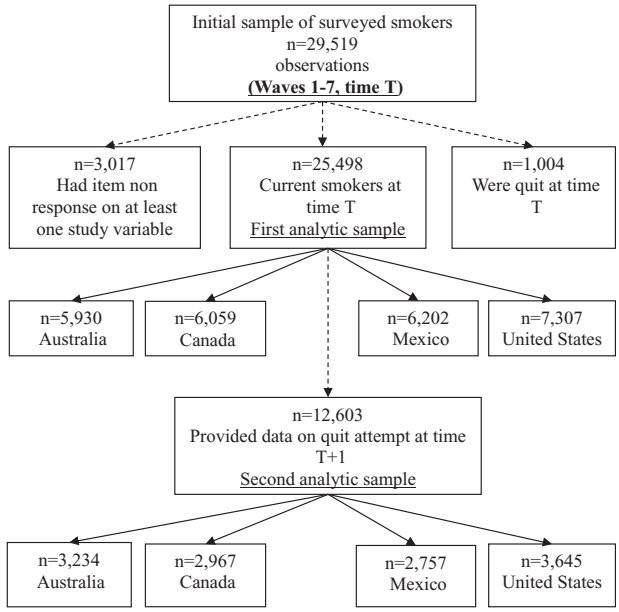

Fig. 1. Study flow chart.

T. First, we estimated an unadjusted model (Model 1); then in Model 2 we adjusted for covariates (i.e. sociodemographics, smoking-related variables, survey variables). In Model 3 we further adjusted for interpersonal communication about HWLs to examine whether HWLs disparagement is associated with subsequent quit attempts above and beyond the effect of more general frequency of talking to others about HWLs. The analytic subsample for this analyses included only participants for whom we had data from the subsequent wave in each country (Fig. 1). All analyses were conducted using Stata version 13.

Results

Sample characteristics

Table I presents sample characteristics for each country. About half the sample in each country were male, and about a third had high school education or less. The majority of participants in Australia, Canada and the US were daily smokers, and about half the Mexican sample were daily smokers. In each country, between 40 and 54% of smokers had made an attempt to quit within the past 4 months. In each country, across all waves, 24–31% of the sample reported making fun of HWLs at least once in the past month.

Correlates of HWL disparagement

Table II presents the associations of sociodemographic and smoking-related factors with HWLs disparagement. In all countries, more frequent HWLs disparagement was positively associated with younger age, being male (versus female), higher educational attainment, heavier smoking and having made a quit attempt in the prior 4 months. In the US sample only, HWLs disparagement was positively associated with income (IRR = 1.12, 95% CI = 1.07–1.17 for high versus low income) and with intention to quit (IRR = 1.10, 95% CI = 1.06–1.14).

HWL disparagement and other responses to HWLs

In both unadjusted and adjusted Poisson GEE models (Table III), attention to HWLs was positively associated with HWLs disparagement in Australia (IRR = 1.09, 95% CI = 1.07–1.11),

Table I. *Sample characteristics*

	Australia ($n = 5930$)	Canada ($n = 6059$)	Mexico ($n = 6202$)	US ($n = 7307$)
	%	%	%	%
Make fun of HWLs in the past month				
Never	71	76	69	75
Once	7	6	8	5
A few times	14	12	15	12
Often	5	3	5	5
Very often	3	3	3	3
Age				
18–24	8	11	18	16
25–34	23	22	30	28
35–44	23	22	22	20
45–54	24	22	17	19
55–64	22	23	13	17
Sex				
Male	46	46	56	51
Female	54	54	44	49
Education				
High school or less	33	30	30	28
Some college or university	40	44	19	38
Completed university+	27	26	51	34
Income				
Low	22	26	39	28
Middle	27	31	33	34
High	51	43	28	38
HSI [mean (SD)]	2.73 (1.59)	2.42 (1.54)	0.83 (1.23)	2.26 (1.54)
Cigarette consumption				
Non-daily	15	18	51	23
Daily	85	82	49	77
Quit intention				
No	55	54	53	56
Yes	45	46	47	44
Made quit attempt in the past 4 months				
No	60	60	46	57
Yes	40	40	54	43

Note: n = observations across all waves in each country; HSI (Heaviness of smoking Index, range 0–6); annual income (low = $29 999 or less; middle = $30 000–$59 999; high = $60 000 or more) in Australia, Canada and the US; and monthly income (low = $10 000 or less; middle = $10 001–$20 000; high = $20 001 or more) in Mexico.

Canada (IRR = 1.05, 95% CI = 1.03–1.07) and the US (IRR = 1.18, 95% CI = 1.16–1.19), but not in Mexico. Results for cognitive elaboration of risks due to HWLs were inconsistently associated with HWLs disparagement across countries (Table III). In Canada and Mexico, stronger cognitive responses to HWLs were associated with less disparagement of HWLs, whereas the opposite was true for Australia and the US. In all countries, greater interpersonal communication about HWLs was positively associated with HWL disparagement with evidence for a dose–response association. Lastly, in all countries, avoidance of HWLs was positively associated with HWLs disparagement (Australia, IRR = 1.09, 95% CI = 1.05–1.13; Canada, IRR = 1.08, 95% CI = 1.04–1.12; Mexico,

Table II. *IRRs and 95% CI from adjusted Poisson GEE models regressing making fun of HWLs on sociodemographic and smoking related factors, by country*

	Australia ($n = 5930$)	Canada ($n = 6059$)	Mexico ($n = 6202$)	US ($n = 7307$)
Independent variables	IRR [95% CI]	IRR [95% CI]	IRR [95% CI]	IRR [95% CI]
Age				
18–24	RG	RG	RG	RG
25–34	0.90**	0.92*	0.82***	0.89***
	[0.83–0.95]	[0.86–0.98]	[0.78–0.87]	[0.85–0.94]
35–44	0.76***	0.75***	0.72***	0.74***
	[0.70–0.81]	[0.70–0.81]	[0.68–0.76]	[0.72–0.80]
45–54	0.67***	0.67***	0.63***	0.64***
	[0.62–0.72]	[0.62–0.71]	[0.59–0.67]	[0.60–0.68]
55–64	0.60***	0.59***	0.59***	0.58***
	[0.55–0.64]	[0.55–0.63]	[0.55–0.63]	[0.55–0.61]
Sex				
Male	RG	RG	RG	RG
Female	0.89***	0.91***	0.94**	0.88***
	[0.84–0.92]	[0.87–0.94]	[0.91–0.98]	[0.85–0.91]
Education				
High school or less	RG	RG	RG	RG
Some college or university	1.07**	1.01	1.05	0.97
	[1.02–1.12]	[0.97–1.06]	[0.99–1.10]	[0.94–1.02]
Completed university+	1.24***	1.11***	1.14***	1.18***
	[1.17–1.30]	[1.05–1.18]	[1.09–1.11]	[1.13–1.24]
Income				
Low	RG	RG	RG	RG
Middle	1.02	1.00	1.02	1.03
	[0.96–1.06]	[0.96–1.05]	[0.98–1.06]	[0.99–1.07]
High	1.04	1.03	1.03	1.12***
	[0.98–1.09]	[0.98–1.08]	[0.98–1.08]	[1.07–1.17]
HSI	1.02**	1.02**	1.05***	1.02***
	[1.01–1.04]	[1.007–1.03]	[1.04–1.07]	[1.02–1.04]
Cigarette consumption				
Non-daily	RG	RG	RG	RG
Daily	1.02	0.98	0.99	1.02
	[0.96–1.07]	[0.94–1.03]	[0.95–1.03]	[0.97–1.06]
Quit intention				
No	RG	RG	RG	RG
Yes	1.02	1.01	1.00	1.10***
	[0.99–1.06]	[0.98–1.05]	[0.97–1.04]	[1.06–1.14]
Recent quit attempt				
No	RG	RG	RG	RG
Yes	1.07***	1.06**	1.07***	1.13***
	[1.03–1.11]	[1.02–1.09]	[1.03–1.10]	[1.09–1.17]

Note: RG = reference group; n = number of observations; HSI: Heaviness of Smoking Index; models adjust for wave of survey administration and time in sample; annual income (low = $29 999 or less; middle = $30 000–$59 999; high = $60 000 or more) in Australia, Canada and the US; and monthly income (low = $10 000 or less; middle = $10 001–$20 000; high = $20 001 or more) in Mexico;
***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Table III. *IRR and 95% CIs from Poisson GEE models with responses to HWLs as predictors of making fun of HWLs*

Independent variables	Australia ($n = 5930$)		Canada ($n = 6059$)		Mexico ($n = 6202$)		US ($n = 7307$)	
	Unadjusted IRR [95% CI]	Adjusted IRR [95% CI]	Unadjusted IRR [95% CI]	Adjusted IRR [95% CI]	Unadjusted IRR [95% CI]	Adjusted IRR [95% CI]	Unadjusted IRR [95% CI]	Adjusted IRR [95% CI]
Attention to HWLs	1.13*** [1.11–1.15]	1.09*** [1.07–1.11]	1.07*** [1.05–1.09]	1.05*** [1.03–1.07]	1.01 [0.99–1.03]	1.003 [0.98–1.02]	1.24*** [1.22–1.26]	1.18*** [1.16–1.19]
Cognitive elaboration of risks due to HWLs	1.03*** [1.02–1.04]	1.01** [1.004–1.02]	1.00 [0.99–1.01]	0.99* [0.98–0.99]	0.96*** [0.96–0.98]	0.96*** [0.96–0.98]	1.09*** [1.08–1.09]	1.06*** [1.05–1.07]
Interpersonal communication about HWLs								
Low	RG	RG	RG	RG	RG	RG	RG	RG
Moderate	1.42*** [1.37–1.48]	1.35*** [1.29–1.40]	1.31*** [1.26–1.36]	1.25*** [1.20–1.30]	1.19*** [1.14–1.23]	1.16*** [1.11–1.20]	1.39*** [1.34–1.45]	1.31*** [1.26–1.36]
High	2.06*** [1.99–2.15]	1.87*** [1.79–1.95]	1.78*** [1.70–1.87]	1.64*** [1.56–1.72]	1.38*** [1.32–1.43]	1.33*** [1.28–1.39]	2.25*** [2.18–2.32]	2.00*** [1.93–2.07]
Avoidance of HWLs								
No	RG	RG	RG	RG	RG	RG	RG	RG
Yes	1.15*** [1.11–1.19]	1.09*** [1.05–1.13]	1.12*** [1.08–1.16]	1.08*** [1.04–1.12]	1.11*** [1.07–1.14]	1.10*** [1.06–1.14]	1.49*** [1.44–1.54]	1.35*** [1.31–1.40]

Note: RG = reference group; n = number of observations; Separate multivariate models for each independent variable adjusted for age, sex, education, income, daily versus non-daily cigarette consumption, HSI, quit intention, quit attempt in prior 4 months, time in sample and wave of survey administration;
***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

IRR = 1.10, 95% CI = 1.06–1.14; US, IRR = 1.35, 95% CI = 1.31–1.40).

HWL disparagement and cessation attempts

In bi-variate (Model 1) and adjusted (Model 2) models (Table IV), more frequent HWL disparagement was independently associated with greater likelihood of subsequent cessation attempts compared with no disparagement in Australia (OR = 1.81, 95% CI = 1.43–2.28); Canada (OR = 1.54, 95% CI = 1.19–2.00); Mexico (OR = 1.55, 95% CI = 1.23–1.94) and the US (OR = 1.48, 95% CI = 1.16–1.88). In all countries except the US, more frequent HWL disparagement continues to be independently associated with greater likelihood of subsequent cessation attempts compared with no disparagement after adjusting for more general interpersonal communication about HWLs (Australia: OR = 1.53, 95% CI = 1.17–2.00); Canada (OR = 1.34, 95% CI = 1.01–1.77); Mexico (OR = 1.38, 95% CI = 1.09–1.75) (Model 3).

Sensitivity analysis

To better characterize our cessation outcome variable (i.e. cessation attempt), for each participant we derived a 24-hour abstinence variable at time T + 1. Considering this information, we found that 41% of the sample (Australia = 33%; Canada = 36%; Mexico = 53%; US = 35%) reported any quit attempt and had quit for at least 24 hours during the follow-up period. In a sensitivity analysis, unadjusted and adjusted models predicting subsequent cessation attempt were estimated again using '1 = abstinence for 24 hours or more' versus '0 = abstinence for less than 24 hours or no quit attempt' as the cessation outcome variable. With one exception, in which adjusting for interpersonal communication about HWLs, the association between HWLs disparagement and future cessation attempt (Table IV, Model 3) did not reach statistical significance in the Canadian, Mexican and the US samples, the pattern of results from all other models was similar in direction, magnitude and significance to

Table IV. *Odds ratios (ORs) and 95% CIs from logistic GEE models predicting making a quit attempt at the subsequent wave*

Independent variables	Australia ($n = 3234$)			Canada ($n = 2967$)			Mexico ($n = 2757$)			US ($n = 3645$)		
	Model 1 OR [95% CI]	Model 2 OR [95% CI]	Model 3 OR [95% CI]	Model 1 OR [95% CI]	Model 2 OR [95% CI]	Model 3 OR [95% CI]	Model 1 OR [95% CI]	Model 2 OR [95% CI]	Model 3 OR [95% CI]	Model 1 OR [95% CI]	Model 2 OR [95% CI]	Model 3 OR [95% CI]
Frequency of making fun of HWLs												
Never	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG	RG
Once	1.20 [0.92–1.57]	1.13 [0.78–1.62]	1.05 [0.72–1.53]	0.95 [0.70–1.29]	0.75 [0.51–1.11]	0.73 [0.49–1.09]	0.99 [0.75–1.29]	1.03 [0.75–1.43]	0.97 [0.70–1.35]	1.84*** [1.36–2.48]	1.28 [0.86–1.89]	1.03 [0.68–1.56]
Few times	1.83***	1.81***	1.53**	1.68***	1.54**	1.34*	1.34**	1.55***	1.38**	2.24***	1.48**	1.09
or more	[1.51–2.23]	[1.43–2.28]	[1.17–2.00]	[1.37–2.06]	[1.19–2.00]	[1.01–1.77]	[1.11–1.62]	[1.23–1.94]	[1.09–1.75]	[1.84–2.73]	[1.16–1.88]	[0.81–1.46]

Note: RG = reference group; n = number of observations. Model 1: unadjusted model; Model 2: adjusts for age, sex, education, income, daily versus non-daily cigarette consumption, HSI, quit intention, quit attempt in prior 4 months, cognitive responses to HWLs, time in sample and wave of survey administration; Model 3 further adjusts for interpersonal communication about HWLs;
***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

the results presented in this paper and would not have changed our conclusions.

Data for this study were collected from unknown sampling frames that may not be representative of the general population of smokers in each of the countries. As a sensitivity analysis, we created weights to weight the data to sex, age and educational profiles of nationally representative data on smokers in each country. All models reported in this paper were estimated again adjusting for weights. The results from weighted models were similar in direction, magnitude and significance to the results presented in our tables and would not have changed any of our conclusions.

Participants in this study were followed up over time. Follow-up rates, however, were low. To attenuate biases related to sample attrition, our adjusted models included statistical adjustment for time in sample (i.e. number of waves in which participants took the survey). To determine if our results were driven by time-in-sample effects, we created country-specific propensity scores by estimating predicted probabilities of participating in varying numbers of survey waves over time. The propensity scores accounted for potential variables that may be associated with time-in-sample and that were not already adjusted for in our analyses (e.g. race/ethnicity, employment status, marital status, number of online surveys completed in the past 4 months, number of online surveys on smoking in the last month, overall health status and reasons for considering quitting smoking). All adjusted models reported in this paper were estimated again, while adjusting for propensity scores. With one exception, in which adjusting for sociodemographic variables and interpersonal communication about HWLs, the association between HWLs disparagement and future cessation attempt (Table IV, Model 3) did not reach statistical significance in the Canadian sample (OR 1.29, 95% CI = 0.96–1.72, $P = 0.08$). For all other models, the pattern of results was similar in direction, magnitude and significance to the results presented in our tables and would not have changed any of our conclusions (results from sensitivity analyses are not presented in this paper and are available on request).

Discussion

In this study of adult smokers in four countries (i.e. Australia, Canada, Mexico and the US), we assessed characteristics of smokers who reported frequent mockery of HWLs on cigarette packs and whether HWL disparagement of this form was associated with subsequent cessation attempts. Unlike the US, where small text-only warnings are printed on the side of cigarette packs, pictorial warning labels in each of Australia, Canada and Mexico display graphic imagery alongside a text warning that depicts the negative health consequences of smoking. Despite differences in HWLs policy in these countries (e.g. text versus pictorial, differences in warning content, size, placement and rotation) smokers commonly reported HWL disparagement across all four countries.

Whether HWLs disparagement by smokers is the result of pictorial HWLs being too fear arousing is not clear. Indeed, the negative health effects of smoking (e.g. Cancer, stroke, other chronic diseases) are inherently fearful and threatening. Research supports that pictorial HWLs, particularly those with graphic imagery that arouses emotional reactions, are more effective than text-only warnings in changing smoking-related attitudes, reducing packaging and smoking appeal, and increasing smokers' intentions and motivation to quit smoking [1, 4, 5, 39]. Yet, our study shows that smokers from countries that do not display fear arousing pictorials on cigarette packs, such as the US, equally (25%) disparage cigarette pack warning labels as smokers in countries that long have been implementing graphic HWLs policy [i.e. Australia (29%), Canada (24%) and Mexico (31%)]. Australia, Canada and Mexico at the time of the survey had implemented a variety of HWLs with varying degrees of fear-arousing graphic content. These countries also included messages about available cessation resources [40] and, to varying degrees, messages about the benefits of cessation. The Canadian HWL policy, in particular, includes the most elaborated gain framed messages on cessation benefits and tips on 'inserts'; small printed leaflets inside of cigarette packs. In this study, HWL disparagement in the form of mockery was the lowest in the Canadian sample of smokers. Pairing these gain framed messages with pictorial depictions of the health risks of smoking on package HWLs appears to increase smokers' self-efficacy to quit and sustained cessation attempts [41]. This messaging strategy could offset defensive reactions to loss-framed fear arousing content that is most often used in HWLs on pack exteriors.

Our results suggest that HWL disparagement in the form of mockery is not counterproductive and may even indicate greater personal relevance and processing of the message, and greater effectiveness, as has been found for other defensive reactions such as avoidance of HWLs [23, 36, 42] and reactance to HWLs [18, 20]. When a message is threatening to one's existing attitude, those who believe that the message is relevant to them are more likely to generate critical judgments regarding the message's content, quality and credibility than do individuals for whom the message is less relevant [43, 44]. In our study, it is more nicotine-addicted smokers and those who made a recent quit attempt who tended to disparage/mock HWLs. Moreover, this kind of HWL disparagement was positively associated with measures of warning processing and effectiveness. Smokers who reported greater attention to HWLs and higher frequency of conversing with others about HWLs also reported greater HWL disparagement/mockery. Indeed, making fun of HWLs indicates that smokers are paying attention to and have read the warnings. In Australia and the US, smokers who reported greater cognitive elaboration of risks due to HWLs (i.e. that HWLs makes them think about the health risks of smoking and make them want to quit) also reported greater disparagement of HWLs. Altogether, these findings suggest that smokers who engage in HWL disparagement exhibit other desirable responses to HWLs, which mostly indicate greater engagement with and processing of HWLs.

Other population level tobacco control initiatives, such as media campaigns, may have influenced participants' reported responses to HWLs on cigarette packs and their quit attempts. For example, right after the start of data collection, Australia introduced

plain packaging and new warning labels (December 2012), along with a brief media campaign. In the US, the TIPS from former smokers' campaign aired recurrently between 2012 and 2014 [45–47]. Mass media campaigns may increase smokers' attention to HWLs, but there is no evidence of interactions/moderation of HWL effects by media campaigns [37, 46, 48, 49]. Nevertheless, to help control for potential differences in the tobacco control environment over time, including changes in HWL content over the study period (i.e. twice in Australia, every 6 months in Mexico), our analytic approach included a statistical control for time. A more nuanced measure of how, with whom and under which context smokers disparage HWL content may help us better understand this issue.

Ultimately, the purpose of pictorial HWLs is to reduce the appeal of cigarettes, discourage smoking and encourage cessation among smokers. Our study reveals that, in each of the countries where pictorial graphic HWLs are implemented (i.e. Australia, Canada and Mexico), greater HWL disparagement in the form of mockery was associated with greater likelihood for making future cessation attempts. In the US, which has small text-only HWLs displayed on the side of cigarettes packs, smokers who disparaged HWLs were no less or more likely to make a future quit attempt than those who did not disparage HWLs. Overall, these findings indicate that HWL disparagement of this form does not have counterproductive effects and that, in the context of pictorial HWLs, it may even help promote smoking cessation behaviors. As such, it appears to be one type of interpersonal communication that HWLs promote on the way to cessation [29].

Limitations

Data for our study came from online consumer panels assembled to represent the general population for marketing research, but which have no known sampling frame. Hence, the generalizability of the results to the broader population may be uncertain and led us to avoid conducting cross-country comparisons. Furthermore, unknown differences in how samples were recruited make it difficult to evaluate biases regarding to external validity. Nevertheless, the Canadian, Australian and the US samples are more similar to the general population of smokers than the Mexican sample. For example, the percentage of smokers with university-level education is higher in Mexico than in the Canadian, Australian or the US samples. This could in part be because of differences in internet access and use rate in Mexico (43%) when compared with Australia (83%), Canada (86%) and the US (84%), according to 2015 estimates [50].

All measures in this study including the main construct of 'HWLs disparagement' were self-reported, hence are subject to recall and social desirability biases. Social desirability, however, is likely to be minimized by the anonymous, self-administered, online survey modality. To the extent that these biases occurred in our data, they likely lead us to underestimate the magnitude of HWL disparagement in the general population of smokers. Our single item measure to assess 'HWLs disparagement' operationalized as making fun of warning labels may not capture all aspects of disparagement. This measurement approach is, however, similar to the measurement of other defensive reactions, such as HWLs avoidance, in previous research [4, 17, 18, 20, 23]. Further, associations between our measure and both defensive responses (i.e. warning avoidance) and more general talking about warnings provide evidence of its construct validity (i.e. associations with variables with which theory suggests it should be associated). Furthermore, the fact that making fun of warning labels is associated with subsequent quit attempts, independent of other warning responses (including general communication about warnings) provides evidence of its potential utility for understanding how warnings work. Finally, its significant associations with other measures of warning label effectiveness (e.g. attention, cognitive responses) provide some insights into why this measure of disparagement appears to promote quit attempts instead of undermining them (i.e. it may indicate greater message processing).

Although disparagement does not necessarily entail interpersonal communication, the constructs

of HWLs disparagement and interpersonal communication about HWLs may overlap. In future research, more comprehensive measures of message disparagement and other defensive reactions may help disentangle the role of defensive reactions to tobacco communications and, thereby, more clearly distinguish the content of interpersonal discussion about HWLs and its impact among consumers. Nevertheless, our results are consistent with most prior research on indicators of 'defensive avoidance', suggesting that this domain of responses to HWL messages does not lead to counterproductive effects and may even serve as indicator of more extensive message processing and impact.

Conclusions

HWL disparagement in the form of mockery among smokers appears to indicate greater engagement with HWL messages and greater likelihood for subsequent attempts to quit, suggesting that it does not result in counterproductive effects on smokers. These findings are consistent with other research suggesting that message disparagement indicates greater message relevance and processing.

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Conflict of interest statement

None declared.

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