

Use of and beliefs about light cigarettes in four countries: Findings from the International Tobacco Control Policy Evaluation Survey

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This study examined reported use of, and beliefs about, so-called light cigarettes among adult smokers in four countries: Australia (Aus), Canada (Can), the United Kingdom (U.K.) and the United States (U.S.). The method used was parallel telephone surveys among 9,046 smokers across the four countries. The results indicated that more than half of all smokers in each country except the U.K. reported smoking light cigarette brands. A majority of smokers surveyed in each country except Canada continue to believe that light cigarettes offer some health benefit compared to regular cigarettes (Canada 43%, U.S. 51%, Australia 55%, U.K. 70%). A majority of smokers in all four countries believed that light cigarettes are smoother on the throat and chest than regular cigarettes. Predictors of use of light cigarettes and beliefs about possible benefits were very similar in the four countries. These results demonstrate an ongoing need for public education about why light cigarettes do not reduce harm and do not make quitting easier. The results provide further evidence for the need for regulatory measures in all four countries to prohibit the use of misleading light and mild descriptors including package imagery in product marketing (as prescribed in Article 11 of the Framework Convention on Tobacco Control), abandon the use of standard FTC/ISO tar and nicotine yields as consumer information, and adopt policies to regulate deceptive design features of cigarettes, such as ventilated filters.

Introduction

Smokers have been given complex and conflicting messages about so-called light, mild or low-tar cigarettes over the past four decades. How these messages have been assimilated by smokers and how smokers' resulting beliefs have affected their behaviors are important issues for ongoing efforts to reduce the health burden from smoking. This paper is concerned with current beliefs about light cigarettes among

smokers in four countries where the low-tar strategy was pioneered: Australia, Canada, the United Kingdom and the United States.

Cigarettes are rated in terms of the yield of tar using an ISO standard. Unfortunately, this standard bears little relationship with the actual exposures of smokers (DHHS, 1996). Tobacco companies have used a variety of strategies for promoting lower ISO yield products, including use of a variety of light and mild descriptors (super light, ultra light, etc), where they were marketed as variants of existing brand lines. These descriptors are not tied to particular ISO levels but do correlate with them. In this paper we focus on smokers' perceptions of light cigarettes, independent of the means by which they formed those perceptions. We use the term *lights* to refer to cigarettes characterized as light, mild or low in tar. Because of variations in branding practices between the four countries, we did not attempt to differentiate between light and ultra light cigarettes.

In the 1950s and 1960s, ignorant of the lack of relationship between yield and exposure, some experts suggested that smokers who were unwilling to quit

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consider switching to low-tar brands. This advice began to be given on an official basis in 1966, when the U.S. Public Health Service stated: "The preponderance of scientific evidence strongly suggests that the lower the 'tar' and nicotine content of cigarette smoke, the less harmful would be the effect" (Peeler, 1996). Later, smokers would also be advised that low-tar cigarettes deliver less nicotine and thus might facilitate future quitting.

Between 1967 and 1972, the publication of tar tables commenced in the U.S., Australia, Canada and the U.K., enabling smokers to identify brands with lower machine-measured tar and nicotine yields (Heath, 1984). Over this period, cigarette manufacturers increased development and promotion of low-tar brands. These developments led to a steady increase in the market share of low-tar brands in all four countries, as many smokers who might otherwise have quit decided instead to switch to low-tar brands, under the misapprehension they were reducing their disease risks (Burns, Major, Shanks, Thun & Samet, 2001; Cummings & Hyland, 2001).

Three lines of evidence gradually accumulated to undermine expert support for the low-tar harm reduction strategy:

1. Studies of the relationships between machine-measured yields and smokers' actual intakes showed that most smokers regulate their nicotine intakes to produce rewarding sensations and avoid the aversive sensations associated with nicotine withdrawal (Russell, 1990; Benowitz, 2001). The upshot is that reductions in machine-measured nicotine yields will be counteracted by compensatory smoking behaviors, such as taking more and larger puffs, inhaling more deeply and blocking filter vents to increase smoke concentration (Kozlowski, O'Connor & Sweeney, 2001). More recent studies have shown that compensation is likely to be complete for most smokers who down-switch (Benowitz, 2001).
2. In the 1980s, independent researchers began investigating the possibilities filter ventilation presents for smokers to gain high intakes from brands with low machine-tested yields, through vent blocking and increases in puff size (Kozlowski, O'Connor & Sweeney, 2001). Tobacco industry documents show that filter ventilation was a key means of engineering low-tar cigarettes to facilitate compensation, while creating the illusion of reduced intakes through more dilute, less irritating smoke (Kozlowski & O'Connor, 2002; Goodman, 1982).
3. While earlier epidemiological studies produced findings consistent with a relative health benefit from smoking lower tar yield cigarettes (particularly for lung cancer mortality), the population level reductions in mortality that were expected to

follow in the longer term from yield reductions did not materialize (Burns et al., 2001). In fact, there is strong evidence that the lifetime risks from cigarette smoking increased during the period when machine tested tar and nicotine yields declined markedly (Burns et al., 2001).

For most of the period when the above-described evidence was accumulating, smokers were advised that the balance of evidence remained consistent with relative health benefits from switching to low-tar cigarettes. However, during the 1980s and early 1990s there was increasing advice to low-tar smokers to avoid smoking more cigarettes per day, inhaling more deeply or otherwise undermining potential benefits (eg: Surgeon General, 1981; Department of Health, 1984; Department of Health, 1994; Australian Consumers Association, 1993). Thus, there have been three phases of public health authority/expert advice to smokers concerning lower yield cigarettes, running from relative confidence in reduced risks, through increasing uncertainty in the 1980s and 1990s to dismissal within the past few years.

The tobacco industry has long encouraged "health concerned" smokers to switch to low-tar brands rather than quit (Kozlowski & Pillitteri, 2001). It has generally done this through information-poor but imagery-rich advertising messages, creating impressions of reduced risk, rather than explicit claims of reduced risk (Cummings, Hyland, Bansal & Giovino, 2004; Hanson & Kysar, 2001; Pollay & Dewhirst, 2001). Light and mild brand descriptors, in particular, have arguably been highly effective as qualitative surrogates for tar and nicotine yields and also resonate with health messages such as for light food products (Kozlowski & Pillitteri, 2001). Use of such indirect methods allows the tobacco industry to create the impression that lights are reduced risk, while claiming in other contexts that products bearing these descriptors are intended purely to cater for specific taste preferences and disavowing any intention to capture "health concerned" smokers (Philip Morris, 2004).

Smokers also have first-hand sensory experiences of light cigarettes that influence their beliefs. Experiences that light cigarettes taste lighter and are less irritating than regular cigarettes powerfully support the belief that tar and nicotine intakes are reduced (Kozlowski & Pillitteri, 2001; Kozlowski & O'Connor, 2002; Shiffman, Pillitteri, Burton, Rohay & Gitchell, 2001a). Smokers do not readily perceive that they are inhaling greater volumes of more dilute smoke in order to gain satisfying nicotine doses. Many smokers who agree with the contention that light cigarettes do not reduce harm *in general* exempt themselves individually, because their sensations convince them they are reducing their intakes, even if other lights smokers are not (Kozlowski & O'Connor, 2002).

Most studies of smokers' beliefs about light cigarettes have been conducted in the United States (Cohen, 1996; Kozlowski, Goldberg, Yost, White, Sweeney & Pillitteri, 1998; Shiffman et al., 2001a), with one study in Canada (Ashley, Cohen & Ferrence, 2001) and one in Switzerland (Etter, Kozlowski & Perneger, 2003). More research is needed to determine their generalizability. One aim of the present study was to compare beliefs about light cigarettes and relevant behaviors across four countries in which the low-tar harm reduction strategy was pioneered and in which a wide range of other tobacco control policies have since been enacted.

Across the four countries of the study, there are differences in products, marketing, public education and regulatory and legal action that could be reflected in differing beliefs about light cigarettes and relevant behaviors. The federal government in Canada issued an Intent to Regulate in 2001, specifying that light and mild brand descriptors would be prohibited. This was followed by a mass-media campaign labeling light and mild as "deceptive and deadly." However, the regulations prohibiting light and mild brand descriptors have still not been introduced. In Europe in June 2002, a directive was passed banning the use of light and mild descriptors by September 2003 across the European Union (including the U.K.). In the U.K., manufacturers started phasing this in during 2003, some months before the deadline, but after our data were collected. Beginning in the late 1990s, there had been considerable debate in the U.K. among tobacco control advocates and in the media about the misleading nature of such brand descriptors (Bates, McNeill, Jarvis & Gray, 1999; Jarvis & Bates 1999). The light cigarette deception has been challenged in a different way in the U.S., with several deceptive conduct cases brought against tobacco companies. These cases have received considerable publicity, both in the U.S. and elsewhere. By comparison with these countries, there had only been intermittent publicity of the issue in Australia to the time the data for this study were collected.

Light cigarettes are marketed in all four countries, with within-brand differentiation of strength relying predominantly on the terms light and mild in the U.S. and Canada, and to a lesser extent the U.K. In Australia several high selling cigarette brand families are differentiated by ISO tar number (in bands) while others are differentiated in terms of variants of light or mild (typically the latter), either alone or in combination with tar numbers.

One major aim of the study was to examine differences in belief/behavior patterns across the four countries. Another aim was to further explore whether the experience that light cigarettes are less harsh accounts for any beliefs among smokers that light cigarettes are, or may be, less harmful. Following on from this, we were interested in whether there were

differences between light and regular cigarette smokers in their beliefs about the harmfulness of smoking in general, perceptions about harm to their health specifically, perceptions about their level of addiction, behavioral measures of addiction, and quitting history and intentions.

Method

Participants

Participants were a total of 9,046 adult (18 years of age and older) smokers (defined as having smoked at least 100 cigarettes lifetime and currently smoking at least once a month) with roughly equal numbers from each of the four participating countries (Canada, the U.S., the U.K. and Australia). Cooperation rates were high for a survey of this kind: U.S. = 77.0%, Canada = 78.5%, U.K. = 78.7%, and Australia = 78.8%.

Procedures

Surveying was conducted between October and December 2002. The study population was derived from persons interviewed as part of the International Tobacco Control Policy Evaluation Survey (ITCPES) carried out in four English-speaking countries: Canada, the U.S., the U.K., and Australia. The survey was designed as a longitudinal study to simultaneously evaluate several leading tobacco control policies that will likely be implemented between 2003 and 2007. A representative sample of over 2000 adult smokers was recruited in each country. Respondents are being followed up annually. The survey field work was conducted using computer-assisted telephone interview (CATI) by two research firms: Roy Morgan Research (Melbourne) for Australia and the U.K., and Environics Research Group (Toronto) for the U.S. and Canada. It was conducted in English, or in French if desired in the Francophone areas of Canada. Strict protocols were developed and implemented to ensure equivalence of methods across the two companies and between the two languages. Using a stratified random-digit dialing technique, households were contacted and screened for adult smokers with the next birthday who would agree to participate in the study. Those who agreed were rescheduled for an in-depth 40-minute phone survey a week later and were sent a check or voucher to compensate for their time. These participants were asked to respond to questions related to tobacco control policies, smoking behavior, and associated psychosocial predictors. The study protocol was cleared for ethics by the Institutional Review Boards or Research Ethics Boards of the University of Waterloo (Canada), Roswell Park

Cancer Institute (U.S.), University of Illinois-Chicago (U.S.), University of Strathclyde (U.K.), and The Cancer Council Victoria (Australia).

Measures

Smokers identified themselves as light cigarette smokers by indicating "yes" to the question: "Some cigarettes are described as light, mild or low in tar. Do you currently smoke these types of cigarettes?" To assess smokers' beliefs about the benefits of light cigarettes, the respondents were asked about how much they agreed or disagreed (using a 5-point scale) with the following three statements: "Light cigarettes make it easier to quit smoking," "Light cigarettes are less harmful than regular cigarettes," and "Smokers of light cigarettes take in less tar than smokers of regular cigarettes." These three items were combined into the Lights Benefit Scale (LBS), whose internal consistency was reasonable (Cronbach $\alpha=.69$). In addition, opinion was sought on the statement "Light cigarettes are smoother on your throat and chest than regular cigarettes." Knowledge about light cigarettes with respect to compensatory smoking was assessed from two true/false questions: "The way a smoker puffs on a cigarette can affect the amount of tar and nicotine a smoker takes in." and "The way a smoker holds a cigarette can affect the amount of tar and nicotine a smoker takes in."

Respondents were also asked about smoking and health: they rated their own health status (from poor to excellent on a 5-point scale), whether smoking had already affected their health, future concerns about adverse effects of smoking on health, and assessed on how much they agreed (using a 5-point scale) with the statement "Smoking is no more risky than lots of other things that people do." Respondents were also asked to indicate whether they had ever tried to quit smoking (yes/no), the extent to which they thought quitting was easy or difficult (on a 5-point scale from very easy to very difficult), their confidence in quitting successfully, and whether they had quit or intended to quit in the next month, next six months, beyond six months, or not at all. They were also asked for their perceived levels of addiction (not at all, somewhat, or very), levels of cigarette consumption per day and time to first cigarette upon waking in minutes. The latter two were combined into the Heaviness of Smoking Index – alternate version (HSI-AV) using the square root of daily cigarette consumption minus the natural logarithm of time to first cigarette of the day. Model comparison using the original seven-category version (Heatherton et al., 1989), and this continuous version suggested that the latter discriminated better. Finally they were asked for demographic information: gender, age, education level, and income. Because of difficulties in comparing the latter two

across countries each was split into three roughly equal categories within each country. For income, "no answer" was used as a separate fourth category.

Weighting procedures

In order to adjust the data to the populations of smokers in each country, we constructed survey weights. These weights were constructed from basic sampling weights (reciprocals of estimated inclusion probabilities) by an adjustment for geographic stratum non-response and stratum attrition between recruitment and main surveys, followed by calibration in each country to national smoker prevalence estimates for groups defined by demographic categories in that country. A full description of the weighting methodology is available at <http://www.itcproject.org>.

Statistical analysis

The statistical package SPSS 11.5 was used for all analyses. Percentages reported in tables for Australia, U.K., U.S., and Canada were based on weighted data except where indicated. Pearson's chi-square tests for categorical variables and analysis of variance for continuous variables were employed to examine differences across countries in various variables of interest. In order to characterize light cigarette smokers, logistic regression was undertaken to assess the odds ratios for the different independent variables of interest while adjusting for other factors related to the dependent variable. Linear regression was undertaken to determine the characteristics of smokers who believed light cigarettes have some health benefits using the LBS as the dependent variable. Preliminary analyses suggested that a number of the demographic and belief variables were not linearly related to the dependent variable. A plot of the relationship revealed a quadratic trend for a number of these variables. The regression model was significantly improved by adding a quadratic term (that is, the square of the independent variable) for each variable, where appropriate, to account for curvilinear relationships. All multivariate analyses were conducted with unweighted data; parallel analyses on weighted data provided the same pattern of results.

Results

Sample characteristics

Table 1 shows the age and gender composition and levels of income and education of the sample in each country. As can be seen, there were some age differences across the four countries with Australia

Table 1. Sample characteristics and smoking related variables by country ($N=9,046$).

Variables	Country				Test of significance
	Canada $n=2206$	US $n=2139$	UK $n=2400$	Australia $n=2301$	
Age (%)					
18–24 yr	15.6	15.8	8.5	16.8	χ^2 (9) = 175.98, $p < .001$
25–39 yr	31.8	30.8	32.4	36.8	
40–54 yr	34.5	33.8	33.9	32.9	
55+ yr	18.0	19.6	25.3	13.5	
Sex % female	54.3	55.1	56.6	52.7	χ^2 (3) = 7.66, $p = .054$
Income (%)					
low	27.6	36.4	28.0	25.7	χ^2 (9) = 136.52, $p < .001$
moderate	36.7	35.4	33.6	34.7	
high	27.6	21.9	28.5	33.6	
refused	8.1	6.3	9.9	6.0	
Education (%)					
low	47.7	45.2	63.4	67.8	χ^2 (6) = 423.47, $p < .001$
moderate	39.5	43.5	24.7	20.1	
high	12.9	11.3	11.9	12.1	
% daily smokers	91.7	91.6	93.3	90.8	χ^2 (3) = 10.81, $p = .013$
Ever tried to quit smoking (% Yes)	83.0	79.2	77.6	81.7	χ^2 (3) = 25.57, $p < .001$
Belief that quitting is difficult (% at least somewhat)	78.4	76.7	76.8	75.1	χ^2 (3) = 6.81, $p > .05$
Intentions to quit (%)					
no plan at all	19.7	25.5	35.1	25.0	χ^2 (12) = 220.50, $p < .001$
beyond 6 months	35.4	39.5	36.1	38.5	
in next 6 months	32.2	22.7	19.8	22.8	
in next month	11.5	10.8	7.8	12.1	
have quit	1.1	1.5	1.2	1.5	
Confident of quitting successfully (% at least very sure)	23.7	26.9	18.2	22.9	χ^2 (3) = 49.55, $p < .001$
Awareness of smoking harm					
mean	1.81	1.71	1.73	1.74	$F(3, 9007) = 75.23, p < .001$
95% CI	1.80–1.82	1.70–1.72	1.72–1.74	1.73–1.75	
Belief that smoking is no more risky than lots of other things people do (% agreeing)	49.0	52.9	53.5	55.7	χ^2 (3) = 21.35, $p < .001$
Heaviness of Smoking Index (alternate version)					
mean	1.58	1.87	1.59	1.75	$F(3, 8940) = 6.19, p < .001$
95% CI	1.47–1.69	1.76–1.99	1.49–1.69	1.63–1.86	
Perceived addiction (% at least somewhat addicted)	96.0	94.5	91.0	94.1	χ^2 (3) = 54.11, $p < .001$
Reported health status (% at least very good)	40.4	34.4	32.5	31.5	χ^2 (3) = 46.48, $p < .001$
Smoking has affected health & quality of life					
mean	2.69	2.68	2.63	2.64	$F(3, 8980) = 2.07, p = .101$
95% CI	2.65–2.74	2.64–2.73	2.58–2.67	2.59–2.68	
Concern that smoking will lower health & quality of life in the future					
mean	1.95	2.04	1.74	1.86	$F(3, 8972) = 41.64, p < .001$
95% CI	1.91–1.99	2.00–2.09	1.70–1.78	1.82–1.89	

Percentages for age and sex were based on unweighted data.

having a greater number of respondents under the age of 24 years and the U.K. having a greater number of respondents over 55 years. Females were over-represented in the survey sample as male smoking prevalence is at least as high if not higher in all four countries. The significant differences in income and education levels reflect in part a failure to equalize our country specific rankings on these variables. Table 1 also provides detail on self-reported health status, levels of addiction and beliefs about smoking and quitting across the four countries. U.K. smokers were lower on measures of addiction, but curiously reported being the least confident in being able to quit successfully and also were least likely to have reported having any intention to quit smoking. U.K.

and Australian smokers reported poorer health than their American and Canadian counterparts. However, with respect to the belief about the risk of smoking, the U.K. and Australian smokers were more likely to agree that smoking was no more risky than lots of other things people do compared with their American and Canadian counterparts. The Canadian smokers were the most aware about the harm of smoking, and together with the U.S. smokers, felt the most affected by smoking in terms of health and quality of life. The U.S. smokers were the most worried about the negative impact of smoking on health and quality of life, while U.K. smokers were the least concerned about how smoking might impact their health.

Table 2. Relevant beliefs and knowledge about light cigarettes by country ($n=9,034$).

	Country				Test of Significance
	Canada	U.S.	U.K.	Australia	
Report smoking "lights" (%)	60.4	58.1	40.1	64.3	$\chi^2(3) = 326.12, p < .001$
Agree lights make quitting easier (%)	12.7	15.2	21.8	17.9	$\chi^2(3) = 74.35, p < .001$
Agree lights are less harmful (%)	16.1	27.5	43.0	27.2	$\chi^2(3) = 413.00, p < .001$
Agree lights give less tar (%)	36.5	42.7	59.5	45.3	$\chi^2(3) = 265.34, p < .001$
Holding at least one of the beliefs that lights confer health benefits (%)	42.9	51.0	69.5	55.1	$\chi^2(3) = 346.17, p < .001$
Lights Benefit Scale*					
mean	2.24	2.47	2.88	2.54	
95% CI	2.20–2.27	2.43–2.50	2.85–2.91	2.51–2.58	$F(3, 9007) = 230.39,$
Lights are smoother on throat & chest (% agreeing)	55.5	67.1	63.0	64.5	$\chi^2(3) = 69.40, p < .001$
Puff affects tar and nicotine (% true)	71.5	76.2	80.3	69.4	$\chi^2(3) = 86.43, p < .001$
Hold affects tar and nicotine (% true)	26.6	23.4	27.8	27.4	$\chi^2(3) = 13.65, p = .003$

* Composite of the three light belief items.

Use and beliefs about lights

Table 2 shows the reported use of and beliefs about light cigarettes in each of the four countries. Roughly 60% of smokers in Australia, Canada and the U.S. report smoking lights, while only 40% of U.K. smokers report smoking them. The U.K. had the highest proportion of smokers who agreed with at least one of the three items in the LBS (light cigarettes make quitting easier, are less harmful and give less tar) and those from Canada clearly the lowest (U.K. = 70% vs. Canada = 43%). More than half of the smokers from all four countries believed that light cigarettes are smoother on their throat and chest.

Less than 30% of the smokers in all countries were aware that the way the cigarette is held affects tar and nicotine yields, while a clear majority were aware that the way the smoker puffs affects tar and nicotine yields. Overall, U.K. smokers were the most knowledgeable on both items.

Predictors of lights use

Table 3 reports weighted logistic regression analyses to identify independent associates of reporting smoking lights. Light cigarette use increases with age, being female, and having high income and high education. Lights smokers were no more likely to report impaired health or that smoking had already damaged their health and quality of life. However, lights smokers were more likely to be concerned about the future impact of smoking on health and quality of life. Lights smokers were also more likely to report being less addicted and score lower on the behavioral addiction measure, but there is no difference in reported difficulty in quitting. Smokers who had ever made a quit attempt and who were interested in quitting sooner than later were also more likely to use light cigarettes, but curiously had lower confidence in

their ability to do so. Believing that light cigarettes have some health benefits was a significant independent predictor of light cigarette use but was no longer significant after the addition of the belief that light cigarettes are smoother on the throat and chest. The odds of using light cigarettes increased by 62% for those who endorsed the latter belief, making it the strongest predictor, apart from not coming from the U.K. Knowledge about tar levels being affected by puffing parameters and the way the cigarette is held was not independently associated with lights use.

Predictors of lights beliefs

We also explored covariates of the LBS. Preliminary analyses revealed that age, income, and belief that smoking is no more risky than lots of other things people do were nonlinearly related to scores on the LBS. Based on scatter plots of the bivariate relationship, a quadratic trend was suggested for each of these three variables. Using a hierarchical model, the linear effects of all relevant covariates were entered into the model first as block 1 and then each quadratic term (represented by the square of the relevant independent variables) was entered in separate blocks to test for the nonlinear effects of age, income, and belief about risk of smoking. The results (see Table 4) revealed that males, smokers from the youngest and the oldest age groups (as compared to the 40–54 age group), the lowest and the highest income groups, and those from the U.K. were more likely to endorse the belief that light cigarettes have health benefits. Also, those who neither agreed nor disagreed that smoking is no more risky than lots of other things people do were more likely to believe in the benefits of light cigarettes. The belief that lights are smoother on the throat and chest was the strongest predictor of the LBS. Being from the U.K. was also a strong predictor. It is notable that smokers with higher scores on the LBS were less likely

Table 3. Logistic regression predicting reporting being a lights smoker ($n=8,592$).

Variables		Lights smokers OR (95% CI)
Age (years)*		1.02 (1.01–1.02)
Gender*	(Female vs Male)	1.39 (1.26–1.53)
Education*	(Moderate vs Low)	1.11 (.99–1.23)
	(High vs Low)	1.23 (1.06–1.44)
Income*	(Moderate vs Low)	1.21 (1.07–1.36)
	(High vs Low)	1.33 (1.17–1.51)
	(Refused vs Low)	1.19 (.98–1.44)
Reported health status		1.03 (.98–1.08)
Smoking has affected health and quality of life		.95 (.89–1.02)
Concern re smoking impact on health and quality of life*		1.17 (1.10–1.25)
Daily smokers*		1.14 (.91–1.43)
Heaviness of Smoking index (alternate version)*		.95 (.92–0.97)
Perceived addiction*		.87 (.79–0.96)
Believe quitting is difficult		.99 (.94–1.04)
Confident of quitting successfully*		.95 (.91–.99)
Had ever made a quit attempt*		1.23 (1.09–1.38)
Intending to quit sooner than later*		1.06 (1.00–1.12)
Believe smoking no more risky than lots of other things people do*		.97 (.93–1.01)
Awareness of smoking harm		1.05 (.85–1.29)
Believe lights confer benefits*		1.05 (.99–1.12)
Believe lights smoother on throat & chest*		1.62 (1.54–1.70)
Believe puff affects tar and nicotine		.89 (.80–1.00)
Believe hold affects tar and nicotine*		1.09 (.97–1.21)
Country*	(Canada vs U.K.)	2.98 (2.59–3.42)
	(U.S. vs U.K.)	2.41 (2.10–2.76)
	(Australia vs U.K.)	3.23 (2.83–3.69)
Nagelkerke's R^2		.18

*Asterisked variables have a significant bivariate relationship ($p < .01$); odds ratios in boldface are significant at $p < .01$.

to have made quit attempts and to report being addicted. It is interesting to note that in the context of controlling for all other variables, smokers' beliefs

about light cigarettes were independent of whether they smoked lights or not. It is also notable that those with high scores on the LBS were more likely to know

Table 4. Linear regression predicting beliefs that lights have some benefits ($n=8,699$).

Variables	Beta	<i>t</i>	<i>p</i>
Age (years)*	-0.25	-4.68	<.001
Age × Age	0.30	5.72	<.001
Gender*	0.04	3.73	<.001
Education*	-.01	-.73	.467
Refused to provide income	.02	2.03	.042
Income*	-.23	-3.82	<.001
Income × Income	.25	4.04	<.001
Reported health status	-.02	-2.03	.042
Smoking affected health quality of life*	.00	.19	.851
Concern re smoking lowering health quality of life*	-.02	-1.18	.237
Currently smoking lights*	.02	-1.52	.128
Daily smokers*	.01	.58	.563
Heaviness of Smoking index (alternate version)*	-.03	-2.17	.030
Perceived addiction*	-.07	-5.75	<.001
Believe quitting is difficult*	.00	.38	.703
Confident of quitting successfully	-.01	-.52	.604
Had tried to quit smoking before*	-0.04	-3.65	<.001
Intending to quit sooner than later*	.01	1.06	.291
Believe smoking is no more risky than lots of other things people do*	.40	6.84	<.001
Belief no more risky × Belief no more risky	-.37	-6.20	<.001
Awareness of smoking harm*	-0.02	-1.77	.078
Believe lights are smoother on throat and chest*	.37	38.09	<.001
Believe puff affects tar and nicotine*	.07	7.56	<.001
Believe hold affects tar and nicotine*	.03	3.56	<.001
Country*	(Canada vs U.K.)	-.25	-21.10
	(U.S. vs U.K.)	-.18	-15.54
	(Australia vs U.K.)	-.15	-12.73

$R^2 = .25$
 $F(27, 8671) = 109.61, p < .001$

* Shows significant bivariate relationship ($p < 0.01$).

about compensatory mechanisms; that both puffing parameters and the way the cigarette is held can affect tar and nicotine yields.

Interactions between the predictors and country

Although not detailed here, we conducted additional analyses using hierarchical models to test for interaction effects of country, especially to see if U.K. smokers' use of lights and beliefs about them were determined differently. The hierarchical analysis was carried out in two blocks: first, we entered all relevant covariates into the model as block 1, and then in block 2 we entered all the product terms of country dummy variables (coded with U.K. as the baseline category) with each of the covariates already entered in block 1. The results showed that the predictive model for both use of lights and beliefs applied equally well to all four countries with two minor exceptions. Age and income effects on light use interacted with country such that older smokers from the U.K. were relatively (not absolutely) more likely than those from Canada to use light cigarettes, and smokers with moderate income from countries other than the U.K. were relatively (not absolutely) more likely to use light cigarettes. These between-country differences were considered relatively minor in the context of testing over 65 interaction terms. We also conducted the same series of analyses on associates of the LBS among only lights smokers, and found essentially the same results, suggesting that being a current lights smoker does not affect beliefs about the benefits of lights to any appreciable degree.

Discussion

We found that the factors associated with using so-called light cigarettes and beliefs that they may be less harmful were similar across the four countries studied. This finding is particularly notable given that there were quite marked differences between the four countries in the reported prevalence of smoking light cigarette brands and in reported beliefs in the benefits of smoking lights. Beyond this, the present study confirms much of what previous studies have found about smokers of light cigarettes and smokers' beliefs that they may confer health benefits. The tendency of smokers to believe that lights confer benefits is still prevalent in all four countries, with a majority in all countries except Canada endorsing at least one of the three belief items. There are no direct comparisons between our data and earlier studies (Shiffman, et al., 2001a; Giovino et al., 1996), but levels of endorsing such beliefs are probably somewhat lower than they were in the 1990s.

Beliefs that smoking light cigarette brands could reduce harm appear to be strongly predicted from smokers' reports that light cigarettes are less harsh to smoke. This confirms the findings of Shiffman et al. (2001a) and suggests that their findings have widespread applicability. Our finding that the relationship between the experience that light cigarettes are less harsh and irritating and beliefs that they are less harmful was as strong among smokers who were not currently smoking lights as it was among current lights smokers, is notable. It suggests that past experiences and/or reports of other smokers can be equally as important as current experience in determining these beliefs.

Secondly, we found that self-reported lights smokers appear less behaviorally addicted than regular smokers and also perceive themselves as less addicted. They are also more likely to have ever made a quit attempt than regular smokers and have stronger quit intentions but less confidence in their capacity to quit in the future. This is a curious mix of beliefs, if it represents a sustained state of affairs. It could mean that in the future lights smokers are likely to try to quit in greater numbers than other smokers, but perhaps will be less likely to succeed. Hyland, Hughes, Farrelly and Cummings (2003) also found that lights smokers expressed a stronger desire to quit but went on to find that they were no more likely to make quit attempts or succeed in quitting than regular cigarette smokers. Thus, there are grounds for suggesting that lights smokers have an unrealistically optimistic view of their likelihood of quitting. In subsequent rounds of the survey we should be able to test this notion.

A new finding of interest was that knowledge of the mechanisms of compensatory smoking was associated with heightened belief in the health benefits of light cigarettes. This result was unexpected. It could be that many smokers are aware that light cigarettes theoretically confer health benefits if they are not smoked harder and believe that they can control their smoking behaviors sufficiently well to realize those theoretical benefits. If this were so, it is unfortunate, given the findings of recent studies of smokers' nicotine intakes, such as the Jarvis, Boreham, Primatesta, Feyerabend and Bryant (2001) study, which suggest that no more than a small proportion of smokers are able to exercise such control.

A major challenge for this study was in formulating a decision rule for identifying lights smokers. We contemplated using light and mild designations on packs, but there are brands in some markets with low standard ISO tar/nicotine yields that could define them as light but which do not carry a light or mild descriptor. For instance, in Australia, the variants within some popular brand families are distinguished by nominal tar yields, rather than mild descriptors. We also contemplated using reported FTC/ISO tar yields, but previous studies have found that smokers

are not very good at recalling them (Borland & Hill, 1997; Cohen, 1996), and those yields are not equally available in all countries. We finally decided to focus on smokers' subjective perceptions of the products they smoke in preference to any objective criteria, as these are likely to be what is most affecting their choices, and thus the relationship between choice of cigarette type and beliefs about relative health benefits. The use of self-reported lights smoking does cause certain complications for the interpretation of the results.

It is possible that the lower prevalence of reported lights use in the U.K. is a result of different perceptions as to what a light is, rather than less use of lower ISO yield cigarettes. In the U.K., cigarettes of less than 10 mg tar yield are conventionally considered light, while in the U.S., levels of less than 16 mg are considered light (Giovino, et al., 1996), as is the case in Canada. However, in Australia levels below between 8 and 12 mg are generally considered light, so this does not fully explain the differences in reported use. We are currently collecting data on ISO yields by brand for all countries and, once we have this data, we will be able to relate perceptions to rated yields. In this context, it is worth noting that we conducted analyses demonstrating that the covariates of reporting smoking of lights are similar in all four countries. Thus, whatever differences may exist in the meaning of lights across the four countries, it is not apparently having any major impact on the relationships between lights-related and other variables.

With regard to differences among countries in the belief that lights are associated with health benefits, Canadian smokers were least likely to hold such misbeliefs. This was likely due to the high-profile mass media campaign by the Canadian Government to inform the public of the falsity of such beliefs, described earlier, that accompanied the issuance of the intention of the government to ban such terms. It is, however, less clear why U.K. smokers were most likely to hold misbeliefs about light cigarette brands. This is doubly surprising given that there have been campaigns and advocacy in the U.K. about the misleading nature of lights. It is possible that the U.K. campaigns, which focused on the ability to compensate with light cigarettes, resulted in smokers being more likely to believe that they could control their smoking behavior and gain a net health impact from switching to lights. This is consistent with their relatively greater knowledge about compensatory smoking. However, it may also be in some way related to U.K. lights smokers being a smaller proportion of smokers. More research is needed into these differences between the U.K. smokers and those from the other countries.

A second limitation of this study is that it reports only cross-sectional data, making causal inferences less certain, at least without corroborative longitudinal

and/or experimental data from other sources. However, the ITC PES is a cohort study and with the accumulation of future survey waves, we will be able to test the direction of effects longitudinally.

The other major limitation is that this study is restricted to four largely English-speaking and affluent countries, which have all had lights in various forms since the early 1970s at latest. Care should be taken in generalizing these findings to other countries, with the degree of care being proportional to the magnitude of cultural and economic differences. It would be of considerable value to try to replicate these findings in countries where light cigarettes are also marketed but which otherwise differ more markedly culturally and economically than do Australia, Canada, the U.K. and the U.S.A.

Policy implications

The most immediate implications of the above described findings emerge from the continuing high prevalence of smokers agreeing with one or more of the suggested health benefits of light cigarettes. These findings suggest that the impacts of campaigns about the lights deception have been more limited than might have been hoped for, and thus much remains to be done. The findings might provide further evidence supporting the implementation of policies to eliminate misleading use of product descriptors, as noted in Article 11 of the Framework Convention on Tobacco Control. The U.K. banned such descriptors between this and the second wave of the study and Canada is likely to follow suit. We will examine the effects in subsequent waves of the study.

The findings also highlight the continuing problem of use of the standard ISO testing conditions to report yields because the way lights are constructed typically leads to a disassociation of the relationship between machine-tested yields and actual deliveries. ISO yields are required to appear on the cigarette pack in three of the countries: Australia and the U.K. (where they are the only quantitative information presented), and Canada, (where they are presented alongside yields under intensive smoking conditions). Standard FTC tar, nicotine, and carbon monoxide yields are also made widely available in the U.S. in advertising and are sometimes printed on packs as well (almost invariably when the numbers are low). Although, as was noted above, these numbers are not well recalled by smokers, they are a source of information on whether the cigarette is light or not (Cohen, 1996) and are thus a source of confusion and misleading to consumers. Thus, these yields should not be used in any context where they could be interpreted as estimates of smokers' actual exposures. The Australian government has recently announced it will remove these descriptors from packs (scheduled from January 2006) and we believe this will be a productive step.

However, it is important that *both* misleading light and mild brand descriptors and standard FTC/ISO yields be removed from packs and other product promotions.

One reason for misperceptions about health benefits of light cigarettes is that they are easier to smoke, because the smoke is less harsh due to its dilution through filter ventilation. This finding has important policy implications since it is inherently deceptive and misleading for cigarette manufacturers to utilize design methods that make an inherently harmful product like cigarettes more palatable and easier to inhale. In consumers' minds, less harshness and bite to the smoke is perceived as less harmful, even though scientific evidence shows this is not the case. It may be possible to reduce these misconceptions through education (Shiffman et al., 2001b), but that does not solve the problem. Government agencies committed to harm reduction strategies for tobacco control should urgently investigate the prohibition of design features such as filter vents that make cigarette smoke more palatable and less harsh to inhale. Kozlowski and O'Connor (2002) and Gray and Kozlowski (2003) have previously proposed that filter ventilation should be banned, and we believe that the present study strengthens the case for that proposal. It seems likely that simply attempting to inform smokers about compensation (as some cigarette manufacturers propose) will be insufficient to correct misperceptions about light cigarettes. Many smokers apparently continue to interpret information about compensatory smoking as advice that they can use light cigarettes to reduce their intake if they try, rather than understanding that filter ventilated cigarettes are designed to undermine efforts by smokers to reduce their intakes.

Conclusion

Mistaken beliefs about the possible benefits of light cigarettes are still widespread in Australia, Canada, the U.K. and the U.S. This remains so even in countries where there has been considerable effort to educate the population about the light and mild deception. Further measures are urgently needed, including prohibition of misleading descriptors, removal of FTC/ISO yield information from packs and other promotional materials, and regulation of inherently deceptive design features of cigarettes.

Acknowledgments

We wish to thank Ruth Loewen and Pete Driezen for data management. This research was supported by grants from the Canadian Institutes for Health Research (#57897), Robert Wood Johnson Foundation (#045734), Cancer Research U.K.(#C312/A3726), Australian Commonwealth Department of Health and Ageing, the National Health and Medical Research Council of

Australia (#265903), Canadian Tobacco Control Research Initiative, the National Cancer Institute of the United States (1 PSO CA111236), and the Centre for Behavioural Research and Program Evaluation of the National Cancer Institute of Canada/Canadian Cancer Society.

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