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Is the effectiveness of tobacco image-based warning labels likely to vary by socio-demographic variable? Findings from an online survey of 19,000 members of the UK Public

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Abstract

Objective: Smoking continues to be a major global cause of mortality and morbidity. Countries have increasingly adopted the use of images as warnings on cigarette packs. We aimed to investigate the likely differential impact of varied images and messages on sub-groups of the United Kingdom (UK) smoking population.

Methods: Forty two images developed and approved by the European Union (EU) were viewed by participants in an online survey. Respondents indicated which images they felt would most effectively reduce rates of smoking. Socio-demographic data was sought from participating adults including age, sex, occupation, ethnicity and current smoking behaviour. There were 19,810 participants in the survey.

Results: Three images, with graphic content, were found to consistently stand out as the most popular across all sub-groups. Smokers (as opposed to ex- and non-smokers) and men were found to vote for significantly fewer images, potentially indicating greater scepticism regarding the efficacy of images. Significant socio-demographic variations across a number of images were found suggesting that particular images and messages may have a differential impact on particular sub-groups.

Conclusion: Images may vary significantly in their impact on different social sub-groups. Careful consideration is required when selecting which images to use. Attaching images targeting a sub-group to tobacco brands with that socio-demographic market may enhance the effectiveness of such warnings.

Keywords

behaviour, labels, smoking, warnings

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Background

There are currently more than one billion smokers worldwide,¹ leading to 5.4 million premature deaths per year. By 2030 smoking is estimated to be the leading cause of death.² At present, approximately 21% of the adult population in the United Kingdom (UK) smoke.³ In order to address this a range of policies have been introduced; one relatively recent contribution to the UK government's overall smoking cessation strategy has been the introduction of pictorial warnings on cigarette packs.^{4,5} While the benefits of placing *written* health risk warnings on tobacco packaging have been well documented,^{6,7} there are also good theoretical reasons and growing empirical evidence to suggest that picture-based warnings are associated with an even greater motivation to quit smoking.⁸

If images are to be used then the *content* of such images is crucial as both effectiveness and acceptability are likely to be content dependent. As recent evidence has suggested that the impact of using the same health warnings decreases over time,⁹ it has also been recommended that warnings should be changed intermittently in order to maintain effectiveness.¹⁰ In 2005 the European Commission (EC), following the success of text warnings, published new rules on the use of graphic images on tobacco packaging in order to reinforce the messages – The Tobacco Products Directive (2001/37/EC). For each of the existing 14 EC-approved written health warnings, three associated picture warnings were developed, resulting in 42 graphic images authorized to appear on cigarette packaging. Most are negative images of smoking-induced disease, suffering and death. Member states were then free to select, and use, those images they felt were best suited to their population.

There are good reasons to believe that the use of images is more likely to be effective if the content is targeted at specific social groups. If this is indeed the case it then raises significant challenges and opportunities with regard to future image creation and choice, and may also have implication for the messages subsumed in other smoking cessation strategies. In the UK there are marked differences in gender, age, socio-economic status and ethnicity in relation to smoking. Smoking, a primary contributor to health inequalities, is twice as common among the unemployed and those in lower-status occupations, with higher mortality and morbidity rates compared to those in professional and managerial occupations.^{11–13} Could some images be more effective in influencing the smoking behaviours of particular socio-economic groups? Answering this question could be important if we are to effectively address the current health inequalities associated with tobacco use.

In 2006 the Department of Health (DoH) launched a consultation into the introduction of picture warnings on tobacco packets, inviting the views of UK organizations on the EC library of picture warnings – particularly on which images would have the most impact.⁴ In parallel with the consultation paper a web-based survey was conducted in which members of the public identified the images they thought would be most effective in reducing rates of smoking. In this study we analyze the data obtained via the web-based survey, and identify which images made the greatest impact on the participants and explore image preference by sub-groups based on age, gender, ethnicity and occupational status.

Methods

An online survey method was employed. This included background detail with regard to the purpose of the survey, pictures of all 42 candidate images, and a range of questions with regard to participant characteristics and image preference.

Sample

All adults in the UK over the age of 16 were eligible to participate in the study. However, there was no means of ensuring that individuals were not under this age. The website was advertised through a variety of means including via a link to the British Broadcasting Corporation (BBC) news website and news item.

Data collection

The website displayed 42 images provided from a bank of images approved by the EC. Survey participants were asked to simply indicate all those images that they believed, from their perspective, to be most likely to contribute to smoking cessation. Precise wording was phrased as:

Take a look at all of the picture warnings on the following pages. If you are a smoker, tick all of the warnings which either make you wish you didn't smoke or make you want to try and give up. If you are not a smoker, tick all of the warnings which you think might help persuade smokers to think about giving up. You can click as many warnings as you like.

Respondents were also asked to report their demographic data including current and previous smoking status, age, ethnicity, occupation and gender.

Statistical analysis

Statistical analyses were undertaken using SPSS version 17 and Microsoft Excel software. Endorsement rates were calculated representing the proportion of individuals who had voted for each image. Chi-square tests were used when comparing two or more variables of categorical, discrete data. Each individual image was cross-tabulated with a different demographic variable and a chi-square analysis was performed. Due to the exploratory nature of the research we employed a conservative significance level in order to account for multiple comparisons. Results are reported only where $P < 0.001$. Initial analysis included the entire data set. However, given that the images were intended to have an impact on smokers (rather than non- or ex-smokers), analysis of image preference by social sub-group focussed only on the sub-sample of smokers.

Results

Over 39,000 people visited the website, 26,530 registered their demographic details, and 19,810 voted. Analysis of the demographic data of voters showed 49.8% were male and 50.2% were female; 22.7% were current smokers, while 50.5% and 26.8% were non- and ex-smokers respectively. Age groups were reported in three bands: 16–34 (52.6%), 35–49 (32.9%), and 50+ (14.5%). There was a considerable White ethnic majority within the sample (89.6%), compared to Asian (3.3%), Black (1.6%), mixed (1.7%) and other (1.4%). The sample showed a slight bias towards the employed and non-manual occupations (49.2% were professional or senior/middle managers), compared to students (15.9%), homemakers (3.7%) and unemployed (1.4%).

The highest and least endorsed images

Endorsement rates for each image varied significantly, ranging from 80.5% to 6.4%. The neck tumour (image 17), diseased teeth (image 29) and diseased lungs (image 8) received the highest

percentage of votes (80.5%, 77.5% and 72.1% respectively; see Figure 1). These were the only three images to receive votes from more than 50% of respondents. Images 14, 15 and 39 were the least popular attracting 6.4%, 9.1% and 9.4% respectively (see Figure 2).

Smokers appeared marginally more sceptical than non-smokers and ex-smokers that images would be effective. Smokers rated an average of 10.6 images as being effective, significantly lower than both non-smokers who rated 13.4 images ($p < 0.001$) and ex-smokers who rated 13 images ($p < 0.001$). However, all three groups showed the same rank order preference for the three images rated as having the most impact (images 17, 29 and 8; see Table 1), suggesting that they shared the same tacit assumptions regarding most effective message/mechanism. After the top three images, the rank order sequence was different for all three groups. However, smokers consistently voted fewer times for each image than non-smokers and the ex-smokers.

The top three images were also the highest-ranking images for all sub-groups of smokers (age, gender, ethnicity and occupational status), as indicated in Table 1. Image 17, neck tumour, remained the highest voted image for all groups, with the exception of Black ethnicity for whom the diseased lungs were marginally higher. However, this result was non-significant. There were significant variations in popularity across each image by both gender and age, although the absolute differences in endorsement rate between groups was generally less than 10%.

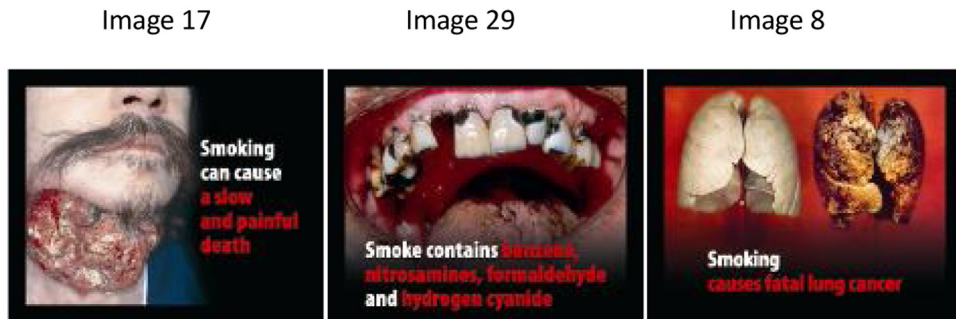


Figure 1. Most highly endorsed images

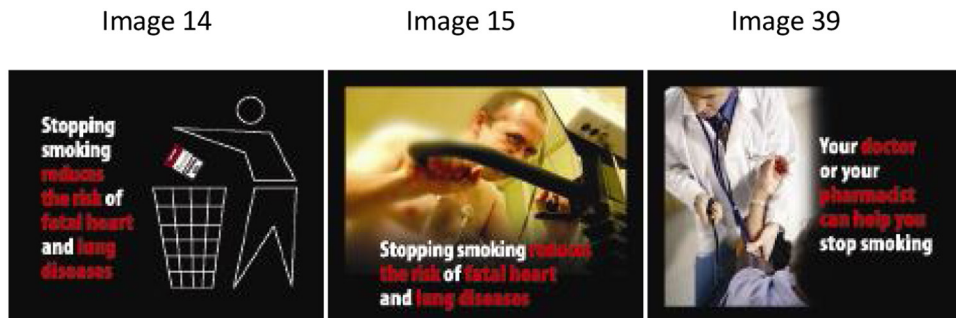


Figure 2. Least highly endorsed images

Table 1. Endorsement rates for the top three images by smoking status, age, gender, ethnicity and occupational status

		Image 8: image of diseased lung	Image 17: image of neck tumour	Image 29: image of diseased teeth
	All respondents (n = 19,810)			
Total sample		72.1	80.5	77.5
Smoking status	Smoker	65.2	73.2	68.9
	Ex-smoker	72.8	82.2	78.8
	Never smoked	74.8	83.0	80.7
	<i>P</i> value	<i>P</i> < 0.001	<i>P</i> < 0.001	<i>P</i> < 0.001
	Smokers only (n = 4,501)			
Gender	Male	65.3	69.6	64.8
	Female	65.1	77.5	73.7
		<i>P</i> < 0.01	<i>P</i> < 0.001	<i>P</i> < 0.001
Age	16–34	66.2	74.7	70.2
	35–49	66.1	73.8	68.9
	50+	58.6	64.2	62.3
	<i>P</i> value	<i>P</i> < 0.01	<i>P</i> < 0.001	<i>P</i> < 0.001
Ethnicity	White	65.9	73.7	69.8
	Black	60.0	65.0	69.0
	Asian	68.5	72.9	64.6
	Mixed	63.6	74.5	64.5
	<i>P</i> value	Non sig	Non sig	Non sig
Occupational Status	Unemployed	57.4	67.2	62.3
	Student	65.0	72.8	68.8
	Manual	66.3	75.8	69.3
	Professional	65.4	73.2	71.1
	<i>P</i> value	Non sig	Non sig	Non sig

Image preference by gender

Female smokers rated an average of 11.4 images as being effective compared to 10.4 images by men (*p* < 0.001). Significant gender differences were observed for many of the images (see Table 2). Women found images relating to pregnancy significantly more persuasive than men. Similarly, women were more persuaded by images depicting children (*p* < 0.001). For two of the images relating to impotence males rated their effectiveness higher than females (*p* < 0.001).

Image preference by age

There were no statistically significant differences between age groups in the mean number of images rated as being effective. Endorsement of graphic images was found to reduce consistently with age (see Table 1). However, a number of images were found to vary in preference across the three age bands (see Table 3). Images relating to fertility and pregnancy received significantly more votes from the youngest age group, while those concerning children were perceived to be most effective by the middle age group. Images that advised not to start smoking, as opposed to

Table 2. Differences in image preference among smokers by gender (N = 4,501)

Image type and number	Male	Female	<i>p</i>
Smokers die younger			
2	31.9%	37.2%	$p < 0.001$
Smoking causes fatal lung cancer			
9	34.9%	41.7%	$p < 0.001$
Smoking is highly addictive, don't start			
10	23.1%	27.3%	$p < 0.001$
Smoking causes aging of the skin			
19	14.3%	19.0%	$p < 0.001$
20	13.3%	19.1%	$p < 0.001$
21	12.9%	18.8%	$p < 0.001$
Smoking can damage the sperm and decreases fertility			
23	14.5%	10.3%	$p < 0.001$
Smoking may reduce the blood flow and causes impotence			
25	16.4%	12.0%	$p < 0.001$
26	21.5%	13.4%	$p < 0.001$
27	26.4%	17.4%	$p < 0.001$
Smoking when pregnant harms your baby			
31	19.5%	32.5%	$p < 0.001$
32	20.4%	32.9%	$p < 0.001$
33	24.1%	43.0%	$p < 0.001$
Protect children, don't make them breathe your smoke			
34	31.4%	45.4%	$p < 0.001$
35	31.1%	46.1%	$p < 0.001$
36	24.1%	36.5%	$p < 0.001$
Smoking contains benzene, nitrosamines, formaldehyde, and hydrogen cyanide			
29	64.8%	73.7%	$p < 0.001$
30	35.3%	40.2%	$p < 0.001$

quitting, were consistently seen as less effective by the youngest age group than the middle and older age groups.

Image preference by ethnicity

The mean number of images rated as having an impact varied from 10.8 (White) to 9.26 (other). Only one image was found to vary significantly by ethnicity. Image 10, which depicted a White middle-aged man in a wheel chair attached to a drip and smoking, with a text caption 'Smoking is highly addictive, don't start' was endorsed by 26.3% of those self-classified as White compared to 18.0%, 12.2% and 24.5% for Black, Asian and mixed groups respectively.

Image preference by occupational status

Occupational grouping did not reflect a standard classification representing socio-economic status. Eleven groupings were listed. We excluded those classified as retired ($n = 126$) and homemakers

Table 3. Differences in image preference among smokers by age category (N = 4,501)

Image type and number	16–34 (1)	34–49 (2)	50+ (3)	<i>p</i>
Smoking clogs the arteries and causes heart attacks and strokes				
4	14.2	16.5	20.5	<i>p</i> < 0.001
Protect children, don't make them breathe your smoke				
36	27.6	33.8	30.6	<i>p</i> < 0.001
Smoking can damage the sperm and decreases fertility				
22	11.2	8.4	6	<i>p</i> < 0.001
23	14.9	9	10.1	<i>p</i> < 0.001
24	14.6	8.4	11.5	<i>p</i> < 0.001
Stopping smoking reduces the risk of fatal heart and lung disease				
12				
13	15.7	20.5	22.8	<i>p</i> < 0.001
15	8.4	11	14.7	<i>p</i> < 0.001
Smoking may reduce the blood flow and causes impotence				
26	20.0%	13.8%	17.0%	<i>p</i> < 0.001
27	25.0%	17.4%	20.7%	<i>p</i> < 0.001
Smoking when pregnant harms your baby				
31	27.3	23.0	21.8	<i>p</i> < 0.001
32	28.3	23.0	22.3	<i>p</i> < 0.001
33	36.2	29.7	22.8	<i>p</i> < 0.001
Your doctor or your pharmacist can help you stop smoking				
38	11.7	14.8	18.9	<i>p</i> < 0.001
Get help to stop smoking				
41	11.5	15.1	17.7	<i>p</i> < 0.001
Smoking is highly addictive, don't start				
12	16.3	19.8	27.3	<i>p</i> < 0.001

(*n* = 206) as this gave no indication of current or past household income. Remaining groupings were re-coded into four categories: unemployed (*n* = 122); student (*n* = 683); manual/middle management (*n* = 1683); and professional/senior management (*n* = 1,427). There was no statistically significant difference in the total number of images endorsed across the four occupational groupings. The only images found to vary significantly related to fertility, impotence and pregnancy, with higher endorsement ratings among students and the unemployed (see Table 4). This finding may be due to the confounding nature of age, with students and the unemployed likely to be younger.

Discussion

Our analysis suggests that, irrespective of the age, gender, ethnicity or occupational status of smokers, graphic warnings are regarded as likely to be more effective than non-graphic images. However,

Table 4. Endorsement rates by occupational grouping (N = 4501)

Image type and number	Unemployed	Student	Manual/middle management	Professional/senior management	P
Smoking can damage the sperm and decreases fertility 23	17.2	18.3	12.5	10.4	$P < 0.001$
Smoking may reduce the blood flow and causes impotence 26	21.3	26.5	15.4	17.4	$P < 0.001$
27	33.6	31.0	19.2	21.8	$P < 0.001$
Smoking when pregnant harms your baby 33	27.9	37.3	34.5	28.5	$P < 0.001$

if other messages and mechanisms are to be used, as may be required as images are rotated, then significant differences between social groups become evident, with younger smokers being more affected by images relating to fertility and impotence. Respondents who were of an age where they were likely to be parents were more influenced by images of smoking and its impact on children, while older smokers' concerns were mainly health related. Within each of the three discrete age groups, image choice was found to be highly consistent. This suggests that, as specific images have a more persuasive effect on particular groups, it may be worth considering a targeted approach to anti-smoking messages, placing appropriate images on brands known to be purchased by young, adult and older smokers.

Graphic images

Three graphic images stood out as consistently regarded by all groups as the most likely to be effective in dissuading individuals to cease smoking. It appears, therefore, that a common lay theory regarding what prompts behaviour change exists among most social groups; the precise mechanism of this change is currently unclear but could be hypothesized as the clear attribution of a consequence of a behaviour that provokes a strong emotional reaction. The nature of that reaction is unclear but would likely be shock, horror, fear or disgust.

This general finding is consistent with the literature that the most graphic images are perceived as the most effective,¹⁴⁻¹⁸ and wider work that supports the link between emotion and behaviour with positive affect encouraging the pursuit of goals and negative affect tends to lead to avoidance or withdrawal behaviours.¹⁹ The use of negative emotion has been debated in the literature since a study of the effect of negative cues within a dental hygiene intervention in 1953 found that strong fear appeals might be counter-productive.²⁰ Since then social marketers in particular have raised concern over such approaches and expressed a preference for messages focussing on more positive emotional outcome and appeal.^{21,22} However, further meta-analyses have concluded that strong fear appeals can promote change in behaviour as long as they are linked to messages of self-efficacy.²³ Interestingly, while some images and associated text within the consultation did include self-efficacy messages, none of the three graphic images did. Instead the choice of text appeared designed to complement and support the interpretation of the image by clarifying the cause of the graphic outcome. Future messages may benefit from rethinking the relationship between text and image according to whether it is regarded as supporting the image meaning and mechanism, or is adding to it. A graphic image with a self-efficacy message might be regarded as more effective according to the literature,²³ a finding supported more recently within the social marketing field

which reported that fear appeals may be more persuasive in the presence of positive messages offering cessation support.¹⁸ At present images and text tend to use a single mechanism rather than a combination as the literature would suggest.

Consultation over behaviour change approach

There is a clear movement over recent years to regard public consultation/involvement as a necessary feature of intervention design.^{24,25} Three arguments would potentially support this: first, that the use of tax-payers' money suggests that they have a right to comment; second, that their involvement is likely to increase the effectiveness of any intervention; and third, that any resultant intervention is more likely to be acceptable. However, our findings suggest that, without careful thought, studies based on these rationales might be sub-optimal. First, our findings suggested that current smokers had different views to both non-smokers and ex-smokers. Consequently a policy that was based on any analysis of the wider group might easily prompt a sub-optimal selection of images. It makes sense that general public consultation might be desirable when issues of principle, values and acceptability regarding the use of public funds in a particular manner are concerned (this has certainly been the case with regard to more recent consultation over the use of incentive-based behaviour changes strategies²⁶). However, when consultation is principally utilitarian in focus, in this case concerned with establishing effectiveness, consultation should surely be with the target audience whose behaviour is to be challenged.

A further concern is that consultation about a likely *future* anticipated behaviour change requires individuals to be able to accurately forecast their reaction (cognitively, emotionally and behaviourally) to a particular intervention. There is little evidence to suggest that this can be done with accuracy; indeed, in the economics field it is known that there can be a clear difference between expressed preferences and revealed preferences.²⁷ Instead it appeared that individuals may have defaulted to their own lay theories of behaviour change, consisting principally of what are commonly regarded as 'shock' tactics. Studies elsewhere have pointed to such lay theories, and again the preponderance of a mechanism that supposes the efficacy of demonstrating graphic consequences. While consultation may be desirable, greater benefit may be obtained not through consulting on the broad desirability and *expected* effect of the mechanism itself but on the *actual* effect of individual elements of that mechanism (e.g. checking the precise interpretation of an image, the emotional consequences, and the actual creation of intentions). Consultation with regard to the interpretation of images may be particularly important as more recent work has begun to highlight both the importance and variation in what has now been termed visual literacy.^{28,29} Consultation that goes beyond correct interpretation and extends to cognitive, emotional and behavioural reactions would favour experimentally based approaches that attempt to seek the public's views on something that has happened rather than ask them to use their imagination with regards to a future scenario.

Image targeting and branding

In terms of health promotion animations (films), the closer the characteristics of both the narrative and visual forms match those of the viewer the greater the likely impact on risk representations.³⁰ This has been demonstrated through studies showing smokers ultrasound images of their

own damaged arteries³¹ and recent personalized cardiac animations.³² Given this matching it is therefore unsurprising that many images appeared to be differentially effective across age and gender, in particular:

- Female smokers were also significantly more affected than men by all three images connected to ageing of the skin.
- Women were also found to be significantly more affected by all of the images associated with pregnancy and with children than men.
- Men were consistently more affected by the images relating to sexual performance/impotence.
- Images relating to heart and lung disease as a consequence of smoking were most effective amongst over 50s.
- Students and professionals were more affected by cosmetic issues than those who were unemployed or retired, possibly due to the impact of damage to their appearance caused by smoking.
- Most of the images relating to fertility, impotence and pregnancy had a significantly greater effect on the 16–39 age group.

While messages correlated with the life *issues* of importance to specific groups, less attempts appeared to have been made with regards to matching images with the *characteristics* of the target group. Theory would suggest that more clearly indicating the age, gender, socio-economic group and ethnicity of the person in the image *as well as* the life issue(s) of importance to that group, effectiveness might be enhanced. Analyzing demographic data allows the opportunity to see whether it is worth targeting particular socio-economic groups with particular images, those identified as being most effective. For example, it may be possible to apply specific images to brands of cigarettes known to be purchased by particular groups. Posters or leaflets portraying carefully selected images could be placed in public spaces certain groups are more likely to occupy than another, such as schools, universities, work places, General Practitioner (GP) surgeries and specific areas of hospitals. In theory, it seems this 'refining' of the application of smoking cessation advertising could make the images more effective in reducing smoking prevalence. However, there are some ethical issues to consider, such as whether targeting women with images relating to appearance will in fact reinforce the message that image is more important than health. Care should also be taken to ensure that images that are likely to cause high levels of fear are presented with information regarding cessation support.

Limitations and future research questions

Our data focusses on anticipated rather than actual effectiveness. Focussing the group analysis solely on the responses of smokers meant that some levels of the variables were reduced to a relatively small sample size. The lack of sample diversity with regard to ethnicity means further research into this area is required. It has also been observed that young people are less responsive to images that provide information about help and support to give up smoking. Researchers need to further investigate the extent that images are able to promote fear amongst different groups. Are there optimal levels of fear for different groups and what are the time limitations for their effectiveness? It is important to address such issues if we are to continue developing our theoretical understanding of the potential of images in encouraging health behaviour change.

Conclusions

Smoking images and messages may have differential impact – that is, some may have more impact on some groups rather than others. Therefore careful consideration is required when selecting which images to use. It may be that attaching specific images to those brands favoured by relevant sub-groups of people may be more effective. As such, policymakers should **seriously** investigate the introduction of targeting different societal groups with the most appropriate vivid, graphic warnings to promote tobacco cessation. However, public consultations alone may not be the best way forward for choosing images – or developing behavioural interventions.



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