

# Healthy weight and lifestyle advertisements: an assessment of their persuasive potential

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## Abstract

This study aimed to identify and analyse the content of previously produced and aired adult-targeted public health advertisements (ads) addressing weight, nutrition or physical activity internationally. Ads were identified via keyword searches of Google, YouTube and websites of relevant government agencies and health organizations, and were eligible for inclusion if they were: in English; produced between 2007 and 2012; targeted at adults;  $\leq 60$  s; not promoting a particular commercial brand of food, fitness or weight loss product. Of the 99 ads coded, 59% featured supportive/encouraging messages, 36% presented information about health consequences and 17% focussed on social norms/acceptability issues. Supportive/encouraging messages were more frequently used in physical activity ads, while there were a higher proportion of messages about health consequences in weight ads. Execution style differed across lifestyle topics, with simulation/animation more common in nutrition ads and graphic images and negative personal testimonials in weight ads. Ads addressing weight were more likely to evoke high negative emotion and include potentially stigmatizing content. Understanding how weight and lifestyle issues have been addressed in recent public health advertising will help guide future efforts to test the effectiveness of different message types in facilitating positive behaviour changes.

## Introduction

Overweight and obesity are prevalent among adults in many countries [1], increasing their risk of serious non-communicable diseases (NCDs) such as heart disease, Type 2 diabetes and some cancers [2]. The World Health Organization recommended mass media as effective avenues for population level dissemination of obesity prevention messages [3]. Public health mass media campaigns aim to initially raise awareness, increase knowledge and change attitudes, and ultimately contribute to behaviour change [4]. Such campaigns often use advertising that invokes cognitive and emotional responses from viewers in an effort to change beliefs and emotions associated with particular health behaviours, and thus strengthen intentions to alter behaviour and increase the likelihood of achieving behaviour change. This approach is consistent with the Theory of Planned Behaviour [5] and the Health Belief Model [6] which predict that modifying an individual's evaluation of the pros and cons of taking preventive action will influence their likelihood of taking such action. Applied to obesity prevention, this could involve informing the public about the health risks associated with obesity and the benefits of a healthy weight, and promoting positive attitudes and beliefs towards modifiable behaviours that can help people achieve or maintain a healthy weight (i.e. lowering dietary energy intake and increasing energy expenditure through physical activity [7]). There is good evidence mass media campaigns can be effective in changing population health

behaviour, but results are variable for diet, weight and activity campaigns [8]. The extent to which obesity prevention campaigns have been successful is likely to result from a combination of factors including the intensity or duration of advertising, success in engaging the intended target audience, the message source and its credibility, and variation in the types of message employed [4, 8–10]. Although all of these influences must be considered when assessing campaign effectiveness, the specific focus of this study is on message content in obesity prevention advertising. Documenting the content and style in which messages about weight and lifestyle have been constructed and presented in public health advertising to date, provides an important research foundation for assessing consumer reactions to such messages and for developing future campaigns on these topics.

It has been postulated in the advertising literature that mass media messages differ on three dimensions: informational content (i.e. what is said); format or style (i.e. how it is said); and emotional content, and that these influence both affective and cognitive responses, and ultimately behavioural intentions [11, 12]. This conceptual model has been widely used in tobacco control research to characterise the content and style of anti-smoking advertisements (ads) [13]. Systematic content analysis of how health messages are presented to the public serves as an integral step towards understanding mass communication effects [14]. However, there is limited research on the content of obesity prevention advertising. One previous study provided a qualitative content analysis of obesity prevention communication and program materials up to 2006, including descriptions of the key themes and messages used in each campaign and a discussion of their adherence to the tenets of Protection Motivation Theory [15]. Kornfield and colleagues examined levels of exposure and content characteristics (e.g. main message, emotional and graphic content, health consequences) for obesity prevention campaigns televised in the United States in 2010–2011 [16]. To our knowledge, no study has used content analysis to quantitatively describe the

characteristics of English language public health ads pertinent to obesity prevention at an international level.

Prior research suggests that particular message content and execution styles in public health advertising are especially persuasive in motivating behaviour change. For example, a review of mass media campaigns promoting smoking cessation indicated ads emphasizing the serious health effects of smoking tend to perform better than how-to-quit and anti-industry messages in generating increased knowledge, beliefs, positive perceived effectiveness ratings or quitting behaviour [17]. There is also strengthening evidence that activation of strong negative emotions and use of graphic and testimonial styles are more effective in motivating quit attempts among adult smokers than ads that do not use these features [17, 18]. While eliciting negative emotions appears to be especially important, the presence of positive emotional content has been found to be effective in reducing smoking prevalence [19] and increasing quitline calls [20].

At the population level, there are some similar factors that influence tobacco use and food and physical activity patterns, including powerful social norms, behaviours driven by addiction or habit and advertising pressures [8, 21]. These similarities suggest there may be commonalities between what has been shown to work well in tobacco control advertising and what might have utility in obesity prevention advertising [21]. While there has been much evaluation of tobacco control advertising, the efficacy of negative emotional messages and graphic imagery in obesity prevention mass media campaigns is as yet unclear. Evaluation of the Australian *LiveLighter* campaign, that graphically depicts the visceral fat of an overweight person, suggests use of graphic content within ads can successfully reach and resonate with their target audience without producing unintended consequences (B. Morley *et al.*, submitted). However, concerns have been raised regarding the possible harms associated with public health campaigns using confronting images to evoke feelings of disgust or having an emphasis on body shape or size [22, 23]. Research has shown obesity

prevention campaign slogans publicly criticized for their stigmatizing content are perceived as less motivating [24]. Further, a randomized controlled trial in the United States found that stigmatizing obesity-related health slogans are no more motivating to consumers than neutral slogans, and induce less self-efficacy [25]. Findings also suggest individuals who feel ashamed or stigmatized about their excess weight are inclined to engage in behaviours that can reinforce weight gain and impair weight loss [25]. As such, including stigmatizing content in obesity prevention advertising may be potentially counter-productive for those who are already overweight.

Despite controversy surrounding use of some fear appeals in public health campaigns [26], research indicates they can be effective if the threat is significant and relevant and they are accompanied by high efficacy messages [27]. Alleyne *et al.* [28] argue using mass communication to raise public concern about the effects of NCDs on global health is necessary for attracting persistent attention to tackling the epidemic. Ads that communicate health risks of overweight and obesity may increase perceptions of personal susceptibility and, according to the Health Belief Model [29], positively influence likelihood of taking preventive action. Other behavioural principles identified as being important drivers of health-related behaviour change are motivation, modelling, capacity (resources available and self-efficacy), remembering and reinforcement [30]. These 'Big Five Principles of Behaviour Change' represent a distillation of key concepts derived from a range of behavioural research and theory (e.g. social cognitive theory, theory of planned behaviour), and are not intended to be exhaustive [30]. As theory-based mass media health campaigns have been recognized as having greater potential to yield change than campaigns not based on theory [4], it is of interest to examine the extent to which theory has been used in obesity prevention advertising. Given the large diversity in theories identified as guiding campaign design in the general health literature between 1996 and 2005 [4], focusing on selected key theoretical determinants of health-related behaviour (as per the Big Five Principles of Behaviour Change), rather than

specific behavioural theories, should provide broad insights into the potential of existing obesity prevention ads to promote health-protective behaviours.

The present study aimed to identify and quantitatively analyse the content of recent, adult-targeted mass media public health ads addressing weight, nutrition and physical activity. We focus on advertising in electronic media suitable for television since television remains the dominant mass medium for reaching the whole population [31]. Adults are a key target group who may personally benefit from obesity prevention interventions and also influence children's diet and activity levels. This study examines the extent to which obesity prevention mass media ads have: (i) utilized content and style elements associated with changes in health-related attitudes, cognitions and behavioural intentions in response to public health advertising on other topics; (2) contained potentially stigmatizing content; (3) mentioned specific NCDs; and (4) applied key principles of behaviour change. It will also establish whether there are notable differences in how messages have been presented to the public based on whether they are focused on weight, nutrition or physical activity.

## Method

### Sample

A sample of recent, English language public health ads addressing weight, nutrition and/or physical activity was compiled. Ads were primarily identified through internet search engine Google and video sharing site YouTube. To optimize results, a variety of search term combinations were used. Keywords included: mass media; campaign; obesity prevention; healthy eating; diet; physical activity; exercise and public education. Additional campaign information and ads were also obtained via the websites of relevant government agencies and health organizations. For an ad to be included in the study, it had to be produced between 2007 and 2012, no longer than 60 s in length, and not promote a particular commercial brand of food, fitness or weight loss product. Ads only targeting children

were excluded. A total of 99 ads met the inclusion criteria and were subsequently coded.

### Coding variables

A coding system was developed based on the tobacco control campaign framework of assessing mass media advertising which characterizes both the content (informational and emotional) and style of the ad [13]. The categories within each variable were adapted to capture the specific types of content and styles used in weight and lifestyle ads (e.g. inclusion of animation, an uncommon style of anti-smoking ads [32]). Descriptive information about each ad including country of origin (i.e. where it was produced and aired), year produced, length, target audience (adults, parents and/or children) and lifestyle topic addressed (weight, nutrition and/or physical activity) were recorded.

Each ad was coded on three dimensions posited to influence consumer responses to ads [11]:

#### *Message content*

After viewing the ad, coders judged whether the information presented was: about health consequences (i.e. providing health arguments/evidence on why people should change their behaviour); supportive/encouraging (i.e. advising how to make and/or encouraging positive behaviour changes) or about social norms/acceptability (i.e. promoting notion that healthy behaviours are socially desirable or acceptable, or that unhealthy behaviours are socially undesirable). Where an ad was deemed to focus equally on two of these categories it was coded as both.

#### *Execution style*

Coders determined which of six execution styles best described how the information in each ad was presented: graphic (e.g. pictures of diseased organ); simulation/animation (e.g. animated characters, models of people or foods); positive testimonial (e.g. personalized narrative of how they lost weight through healthy eating and exercise); negative testimonial (e.g. personalized narrative of how they became obese and developed health problems);

depicted scene (e.g. actors portraying a scenario or series of events) or factual (e.g. statistical information without the use of graphic images, simulation/animation, personal testimonial or depicted scene). Where multiple execution styles appeared in one ad, the ad was coded as being of the style that occupied most time within the ad. However, if a graphic execution style was present anywhere in the ad, the ad was coded as being graphic, irrespective of the duration of graphic content.

#### *Emotional content*

This was assessed based on whether the ad used emotion as a central element to communicate the message and was intended to provoke an intense negative emotional response (e.g. disgust, fear, guilt, sadness) from the target audience. Ads were also coded for the use of humour (including sarcasm and irony).

In addition to these three ad dimensions, we coded ads for stigmatization as such content has been criticized for being detrimental to obesity prevention efforts [33]. Ads were deemed to contain potentially stigmatizing content if they: showed headless images of overweight/obese individuals; used pejorative language; blamed the individual; communicated weight-based stereotypes; included fat jokes/humour or suggested that a person's body weight implies negative assumptions about their character, intelligence, abilities, etc. [34]. As mentions of specific NCDs associated with excess weight and/or poor lifestyle may heighten people's perceived threat of illness, coders recorded whether each ad featured any visual or verbal references to: heart disease (including hypertension and high cholesterol); diabetes (including high blood sugar) and cancer. Inclusion of logos for organizations containing words specifying these NCDs (e.g. Diabetes Australia) were coded as mentions.

As the use of theory has been recommended as a component of effective campaign design [4], ads were coded on a series of seven-point rating scale measures, where 1 = 'not at all', 4 = 'somewhat', and 7 = 'extremely', to evaluate the extent to which they addressed the following 'Big Five Principles of

Behaviour Change': motivation (would make target group want to act); modelling (showing people performing recommended behaviours); objective capacity (promoting physical resources to enable healthy behaviour); subjective capacity (promoting self-efficacy, skills and confidence for healthy behaviour); remembering (is memorable); positive reinforcement (presenting promised reward for taking action) and negative reinforcement (presenting negative consequences of not acting). Scores for each rating scale were dichotomized for analysis with 1–3 categorized as 'no' and 4–7 (i.e. 'somewhat' or higher) as 'yes'.

### Coding procedures

For the two subjective descriptive variables (i.e. target audience and lifestyle topic) and five categorical measures (i.e. message content, execution style, emotional content, stigmatization, and mentions of specific NCDs), each ad was coded independently by two of the authors (H.D. & M.S.), who then discussed any discrepancies and reached consensus as to how these should be coded. For the continuous rating scale measures, an iterative process was employed. First, a sample of 20 ads, followed by a further 10 ads, were coded by two of the authors (H.D. & S.M.), with coding instructions refined until informal assessment suggested an adequate level of agreement. Intercoder reliability was then formally tested on a sample of 10 ads using the dichotomized versions of these rating scales. Kappa values obtained for modelling (1.00), subjective capacity (0.74) and negative reinforcement (1.00) indicated substantial agreement; however, kappa values for motivation (0.44), objective capacity (0.52), remembering (0.09) and positive reinforcement (0.62) were deemed unacceptable. Variables with kappa values below 0.5 (i.e. motivation and remembering) were removed from the coding frame as discussions between the two coders indicated they were unlikely to reach a satisfactory level of agreement. Intercoder reliability for the other two measures was established on an additional sample of 10 articles, with kappa values of 0.80 obtained for both objective capacity and

positive reinforcement. The remaining ads were subsequently coded on the five acceptable scales (i.e. modelling, objective capacity, subjective capacity, positive reinforcement, and negative reinforcement) by one of these two authors.

### Statistical analysis

Data were analysed using Stata SE 12.1 (StataCorp, TX, USA). A series of  $2 \times 2$  chi-square analyses were conducted to examine whether ads of each lifestyle topic were more or less likely than ads about all other topics to: (i) feature particular message content, execution styles, emotional content, potentially stigmatizing content and mentions of specific NCDs (e.g. physical activity vs. not physical activity  $\times$  depicted scene vs. not depicted scene); and (ii) address key behavioural principles. Poisson regression analysis was used to test for linear changes in ad characteristics over time, accounting for the number of ads sampled each year. Due to multiple testing, a conservative level of statistical significance ( $P < 0.01$ ) was applied.

## Results

Overall, 53% of ads sampled focused on nutrition, 40% on weight and 22% on physical activity (Table I). The majority of ads originated from North America (45%) or Australia (37%). Just over half (57%) were 30 s long. Sixty-two percent of ads targeted adults in general, while 13% specifically targeted parents.

### Message content

As per Table II, 59% of the ads featured supportive/encouraging messages, 36% presented information about health consequences and 17% focused on issues related to social norms and acceptability. Supportive/encouraging messages were more frequently used in physical activity ads (86% cf. 51%;  $\chi^2(1) = 9.00$ ,  $P = 0.003$ ) but less common in weight ads (38% cf. 73%;  $\chi^2(1) = 12.30$ ,  $P < 0.001$ ). There was a higher proportion of messages about health consequences in weight ads

**Table I.** Sample characteristics (*n* = 99)

| Characteristic                  | %    | <i>n</i> |
|---------------------------------|------|----------|
| Origin                          |      |          |
| North America                   | 45.5 | 45       |
| Australia                       | 37.4 | 37       |
| Europe                          | 16.2 | 16       |
| Asia                            | 1.0  | 1        |
| Year                            |      |          |
| 2007                            | 7.1  | 7        |
| 2008                            | 14.1 | 14       |
| 2009                            | 20.2 | 20       |
| 2010                            | 25.3 | 25       |
| 2011                            | 22.2 | 22       |
| 2012                            | 11.1 | 11       |
| Length of advertisement         |      |          |
| 15–29 s                         | 23.2 | 23       |
| 30 s                            | 56.6 | 56       |
| 31–59 s                         | 11.1 | 11       |
| 60 s                            | 9.1  | 9        |
| Target audience <sup>a</sup>    |      |          |
| Adults                          | 61.6 | 61       |
| Parents                         | 13.1 | 13       |
| Adults and parents              | 10.1 | 10       |
| Parents and children            | 9.1  | 9        |
| Adults, parents and children    | 5.1  | 5        |
| Adults and children             | 1.0  | 1        |
| Lifestyle topic                 |      |          |
| Nutrition                       | 40.4 | 40       |
| Weight                          | 27.3 | 27       |
| Physical activity               | 17.2 | 17       |
| Weight and nutrition            | 10.1 | 10       |
| Weight and physical activity    | 3.0  | 3        |
| Physical activity and nutrition | 2.0  | 2        |

<sup>a</sup>Ads targeting only children were not included in this content analysis.

compared to all other ads (55% cf. 24%;  $\chi^2(1) = 10.07$ ,  $P = 0.002$ ).

### Execution style

Nearly half (48%) of the ads were categorized as a depicted scene. A further 27% used simulation/animation to convey their message, with this style more common in nutrition ads (38% cf. 15%;  $\chi^2(1) = 6.91$ ,  $P = 0.009$ ). Although not frequent overall, both graphic images (20% cf. 2%;  $\chi^2(1) = 9.67$ ,  $P = 0.002$ ) and negative personal testimonials (20% cf. 0%;  $\chi^2(1) = 12.84$ ,  $P < 0.001$ ) were more likely to appear in weight ads. Nutrition ads were less likely than all other ads to

use negative personal testimonials (0% cf. 17%;  $\chi^2(1) = 9.63$ ,  $P = 0.002$ ). The proportion of all ads using graphic images increased over time (rate ratio [RR] = 3.24, 95% CI: 1.49–7.02,  $P = 0.003$ ) from 0% in 2007 (and 2008, 2009) to 45% in 2012.

### Emotional content

Just under one in five (18%) ads evoked high negative emotion and this was more prevalent among weight ads (35% cf. 7%;  $\chi^2(1) = 12.76$ ,  $P < 0.001$ ). High negative emotion ads also became more common over time (RR = 1.92, 95% CI: 1.27–2.91,  $P = 0.002$ ), increasing from 0% in 2008 (and 2009) to 45% in 2012. Ten percent of ads employed humour.

### Stigmatization

Almost a quarter (23%) of ads included content potentially stigmatizing of people who are overweight. Weight ads were more likely than all other ads to contain potentially stigmatizing content (43% cf. 10%;  $\chi^2(1) = 13.97$ ,  $P < 0.001$ ).

### Mentions of specific non-communicable diseases

Forty-one percent of ads mentioned diabetes, 39% heart disease and 35% cancer. Over half of all ads (58%) included at least one mention of these NCDs. Physical activity ads were less likely to contain reference to diabetes compared to all other ads (14% cf. 49%;  $\chi^2(1) = 9.00$ ,  $P = 0.003$ ).

### Behavioural principles

Overall, 89% of all ads included use of at least one of the key behavioural principles assessed. The most applied behavioural principle in the ads was subjective capacity (71%) followed by objective capacity (68%). Positive (30%) and negative (26%) reinforcement were the least utilized behavioural principles. Physical activity ads more frequently addressed objective capacity (95% cf. 60%;  $\chi^2(1) = 9.98$ ,  $P = 0.002$ ), modelling (95% cf. 40%;  $\chi^2(1) = 20.90$ ,  $P < 0.001$ ) and positive reinforcement (73% cf. 18%;  $\chi^2(1) = 24.10$ ,  $P < 0.001$ ). Weight ads were more likely to employ negative

**Table II.** Proportion of ads on each topic with specified content

| Characteristic                                 | Total<br>( <i>n</i> = 99) (%) | Lifestyle topic                |                                           |                                   |
|------------------------------------------------|-------------------------------|--------------------------------|-------------------------------------------|-----------------------------------|
|                                                |                               | Weight<br>( <i>n</i> = 40) (%) | Physical activity<br>( <i>n</i> = 22) (%) | Nutrition<br>( <i>n</i> = 52) (%) |
| Message content                                |                               |                                |                                           |                                   |
| Supportive/encouraging                         | 46.5                          | 17.5                           | 72.7                                      | 50.0                              |
| Health consequences                            | 24.2                          | 35.0                           | 4.5                                       | 25.0                              |
| Social norms/acceptability                     | 17.2                          | 27.5                           | 9.1                                       | 11.5                              |
| Health consequences and supportive/encouraging | 12.1                          | 20.0                           | 13.6                                      | 13.5                              |
| Execution style                                |                               |                                |                                           |                                   |
| Depicted scene                                 | 48.5                          | 37.5                           | 68.2                                      | 46.2                              |
| Simulation/animation                           | 27.3                          | 15.0                           | 13.6                                      | 38.5                              |
| Graphic                                        | 9.1                           | 20.0                           | 9.1                                       | 11.5                              |
| Negative testimonial                           | 8.1                           | 20.0                           | 0.0                                       | 0.0                               |
| Positive testimonial                           | 6.1                           | 5.0                            | 9.1                                       | 3.8                               |
| Factual                                        | 1.0                           | 2.5                            | 0.0                                       | 0.0                               |
| Emotional content                              |                               |                                |                                           |                                   |
| High negative                                  | 18.2                          | 35.0                           | 9.1                                       | 17.3                              |
| Humorous                                       | 10.1                          | 10.0                           | 13.6                                      | 7.7                               |
| Stigmatization                                 |                               |                                |                                           |                                   |
| Stigmatises people who are overweight          | 23.2                          | 42.5                           | 9.1                                       | 17.3                              |
| Mentions of specific non-communicable diseases |                               |                                |                                           |                                   |
| Diabetes                                       | 41.4                          | 35.0                           | 13.6                                      | 51.9                              |
| Heart disease                                  | 39.4                          | 50.0                           | 45.5                                      | 30.8                              |
| Cancer                                         | 35.4                          | 37.5                           | 22.7                                      | 40.4                              |
| Behavioural principles addressed               |                               |                                |                                           |                                   |
| Subjective capacity                            | 70.7                          | 60.0                           | 86.4                                      | 71.2                              |
| Objective capacity                             | 67.7                          | 50.0                           | 95.5                                      | 67.3                              |
| Modelling                                      | 52.5                          | 37.5                           | 95.5                                      | 48.1                              |
| Positive reinforcement                         | 30.3                          | 17.5                           | 72.7                                      | 21.2                              |
| Negative reinforcement                         | 26.3                          | 52.5                           | 13.6                                      | 17.3                              |

reinforcement (53% cf. 8%;  $\chi^2(1) = 23.86$ ,  $P < 0.001$ ) but less likely to use objective capacity (50% cf. 80%;  $\chi^2(1) = 9.59$ ,  $P = 0.002$ ).

## Discussion

These results provide the first systematic identification and quantitative content analysis of English language, adult-targeted public health ads addressing weight, physical activity and nutrition. The majority of ads originated from the United States and Australia—both affluent countries with a relatively high population prevalence of overweight and obesity [35]—demonstrating investment within these countries in prevention campaigns. Most ads focused on a single lifestyle topic, with a minority

placing equal emphasis within one ad on multiple topics. Given the epidemiology and public health recommendations for each topic are fairly complex, it is unsurprising individual ads tended to focus on a specific behavioural target (e.g. eat ‘2 fruit “*n*” 5 veg everyday’).

The predominant message content of the ads varied by lifestyle topic. Physical activity and nutrition ads tended to be more ‘upbeat’ and focused on prevention and solution. Weight ads more commonly emphasized the health impact and significance of poor lifestyle. In tobacco control research, ‘why to quit’ ads (showing graphic health effects) have been found to be more persuasive than ‘how to quit ads’ (supportive/encouraging messages) [18]. In contrast, obesity prevention

campaign slogans focussed on diet and/or physical activity (with no mention of obesity) were shown to be most positive and motivating among a nationally representative sample of US adults [24]. Further research is needed to test which types of messaging for obesity prevention television ads are most motivating to audiences, or whether using a combination of these messages across different ads for a single campaign maximizes persuasive potential.

Across lifestyle topics, the most common execution style was depicted scene followed by simulation/animation. The style of the animations was generally upbeat, colourful, family friendly and included characters modelling recommended behaviours. A small number of animated ads illustrated internal health effects of lifestyle. Focus group testing of health warnings on cigarette packs found graphic images performed better than cartoon images [36]. Further studies are needed to investigate whether animations are perceived as childish, or less personally relevant than other styles that use actors (depicted scenes) or real people (testimonials), or whether such animated ads are less stigmatizing and make public health recommendations seem simpler and more achievable. Use of graphic ads was uncommon but increased over the years. Weight ads also made more use of graphic imagery and negative testimonials than the ads on the other lifestyle topics. As graphic and personal testimonial ads have been identified as especially effective in the field of tobacco control [18, 37–39], there may be value in broadening the use of these styles in obesity prevention advertising and testing their performance with the target audience.

A minority of ads contained intense emotional content, although high negative emotion ads increased over the years. Weight ads were most likely to use highly negative emotional content, probably because they tend to focus on the risks of being overweight, whereas activity and nutrition ads tend to focus on behaviours people should be doing. Research on anti-tobacco ads indicates intense emotions in ads go hand in hand with message acceptance and personalized perceived effectiveness, and are especially effective in motivating disadvantaged groups [18, 38–40]. It would be helpful for future

studies to investigate whether strongly emotional ads on obesity prevention resonate well with disadvantaged groups, as use of such ads could help reduce socioeconomic disparities in obesity.

It is concerning that four out of ten ads focusing on body weight contained potentially stigmatizing content. The tendency of public health advertising (and the media in general) to frame overweight as an individual rather than societal issue [41] may inadvertently place blame on overweight people for their weight status. Ethical concerns have been raised regarding the use of personal responsibility appeals in health campaign messages [42]. As obesity is likely caused by a combination of internal (e.g. taste preferences) and external (e.g. unhealthy food marketing) factors, there have been arguments for a more balanced approach to health promotion that places equal emphasis on personal and social responsibility [43]. It would be useful to systematically investigate public reactions to obesity-related public health ads citing individual and/or environmental causes for obesity among healthy weight and overweight people. Surveying the target population to determine their understanding of health recommendations and the causes and solutions for obesity could also help identify messaging opportunities.

Mentions of major NCDs related to poor diet, inadequate activity and excess body weight were relatively common in the ads. Disseminating such information via mass media could assist the public in accurately evaluating their personal risk of ill health due to personal lifestyle [29]. As the epidemiological evidence linking cancer to overweight and obesity has emerged more recently than for heart disease and diabetes, it is encouraging cancer has been represented in the range of health consequences presented in the ads. This information may provide audiences with stronger arguments and evidence for making lifestyle changes. As cancer is a highly feared disease [44], provided fear appeals are accompanied by high efficacy messages, this should also motivate behaviour change [27].

Overall, our results indicate that most ads employed key theoretical determinants of behaviour

change as identified by the 'Big Five Principles'. This is a promising finding given that use of theory in mass media health campaigns is recognized as an indicator of likely success [4]. However, there were notable differences across lifestyle topics in the specific behavioural principles that were applied. Objective capacity was used more commonly in physical activity ads than in weight or nutrition ads. Greater emphasis on objective capacity in weight and nutrition ads could take the focus off individual responsibility for these issues to acknowledging and publicizing the notion that achieving real change will require the engagement of government, industry, non-government organizations, individuals and media, to create an environment that supports rather than impedes healthy lifestyle behaviours. Physical activity ads employed the principles of modelling and positive reinforcement more often than weight and diet ads—consistent with their typically supportive/encouraging message content. Negative reinforcement was more common in weight ads. Subjective capacity was addressed by the majority of ads, which was pleasing given self-efficacy beliefs are noted as important determinants of health behaviour in Social Cognitive Theory and the Theory of Planned Behaviour, and a vast body of research attests to this notion [30]. Given many overweight people report knowing they are overweight but feeling helpless or unable to change [25], addressing self-efficacy beliefs in weight and lifestyle ads may be especially important.

The study has several limitations. It is possible other ads exist beyond those identified through our Internet search. Advertising content characterized through our analysis may not be indicative of the content of the excluded ads targeted at children, produced in languages other than English, or disseminated via other media. However, television ads still remain the predominant centre-piece of obesity-related mass media campaigns with supporting communications disseminated through other media (e.g. websites, newspapers, radio). Consequently the major public English language ads are likely to have been captured by our collation of televised ads. There are potential limitations to the process of

content analysis. While we used clear coding procedures and ensured substantial intercoder reliability was achieved, ultimately these were the coder's rather than the general public's assessment of the ads. It is also possible that overweight individuals may perceive the content of the ads differently to healthy weight individuals, particularly with respect to negative emotion and stigmatization. Although the variables coded in our study focused on message characteristics associated with advertising effectiveness in cross-cultural research with smokers [40], we are unable to draw any inferences about the actual persuasiveness (both overall and across varying countries and demographic subgroups) of the ads we examined. Following the present study, we conducted quantitative and qualitative testing of a sample of the ads identified through this content analysis with healthy weight and overweight/obese respondents.

To use mass communication successfully to address obesity, we need to better understand the kinds of messages and executional characteristics to emotionally resonate with the public and drive people to engage in increased activity or to curb their eating behaviour. Through systematically analysing the content of obesity prevention advertising, this study provides insights into which advertising characteristics associated with population impact have been utilized to date. Understanding how weight and lifestyle have been addressed in recent public health advertising will help guide future efforts to test the effectiveness of different message types in facilitating positive behaviour changes.

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