

ORIGINAL ARTICLE

Potential unintended consequences of graphic warning labels on sugary drinks: do they promote obesity stigma?

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Summary

Introduction

Public health interventions need to balance the benefits with any potential harms. One proposed intervention for reducing sugar-sweetened beverage consumption involves placing graphic warning labels on products and advertisements. A recent study found that a graphic warning label that contained negative imagery of obesity reduced purchases of sugar-sweetened beverages. However, these labels may also promote obesity stigma, which is concerning given that weight stigma is associated with harmful health consequences including weight gain and increased risk of mortality.

Methods

In Study 1 ($n = 681$), participants viewed a standard soda label or the graphic warning label online and then completed measures of disgust and prejudice towards people with obesity. In Study 2 ($n = 506$), participants who identified as having overweight or obesity viewed the graphic warning label online before or after completing measures of mood and state self-esteem.

Results

In Study 1, participants who had viewed the graphic warning label reported higher disgust and weight bias. In Study 2, the majority of participants perceived the warning label to be stigmatizing, and participants displayed worse mood and, through this, lower self-esteem after viewing the label.

Conclusions

Although the graphic warning label has been found to reduce sugary drink purchases, it also promotes obesity stigma and is perceived as stigmatizing by individuals with overweight and obesity. Given that weight stigma predicts harmful health and well-being consequences, the benefits of graphic warning labels need to be balanced against the potential costs.

Keywords: Obesity stigma, policy, warning labels, weight bias.

Introduction

Consumption of sugar-sweetened beverages is associated with increased body weight and poor nutrition and health outcomes (1), including Type 2 diabetes (2) and coronary heart disease (3). Consequently, a wide range of efforts have been proposed to attempt to curb intake of these beverages. One approach that policymakers have proposed to reduce sugar intake is the use of warning labels. In 2015, the City of San Francisco passed a law

requiring that soda advertisements contain the following label: 'WARNING: Drinking beverages with added sugar(s) contributes to obesity, diabetes, and tooth decay' (4). The bill has since been challenged by soda advertisers and is currently subject to a legal battle (5). The warning label was designed to highlight the health consequences associated with consuming sugar-sweetened beverages and steer consumers away from purchasing these products. Warning labels have been used by policymakers to curb other unhealthy behaviours, most notably in the context

of cigarette smoking. There is evidence that smoking behaviour reduced after the implementation of graphic warning label policies (6,7) and graphic warning labels appear to be more effective than text-only warning labels (8,9). Graphic warning labels are thought to reduce smoking by eliciting strong emotional reactions, such as fear about the health consequences of smoking (8–10).

More recently, researchers have been investigating whether the use of warning labels could also be effective in reducing sugar-sweetened beverage consumption. Online studies have found that people report lower intentions to choose a sugar-sweetened beverage when a text warning label is presented compared with no warning label (11,12). However, in line with the literature on cigarette smoking, graphic warning labels may be more effective in promoting behaviour change. In one study, negatively framed graphic warning labels (e.g. a label that reads 'Being overweight increases your risk of heart disease' above an image of a healthy heart next to a damaged heart) increased dietary self-control relative to text-only labels, positively framed graphic warning labels and control images (13). A recent field study found that the warning label proposed by the City of San Francisco was only successful in reducing sugary drink purchases when it also contained graphic images corresponding to the health outcomes listed (i.e. an obese man's stomach above the word 'obesity', a woman injecting herself above the word 'diabetes' and rotting teeth above the words 'tooth decay') (14). The graphic warning label (compared with no label) reduced the percentage of sugary bottled drinks purchased by 14.8%. The text-only version of this label did not affect purchasing. A follow-up online study suggested that the graphic warning label may reduce sugary drink purchasing by increasing negative affect towards the beverage and encouraging people to consider the health consequences of their decision (14).

The finding that the graphic warning label was effective in reducing sugary drink purchasing is promising and will be of interest to researchers and policymakers alike. However, such a warning label could have unintended consequences, and these must be investigated before such an intervention is upscaled. One such potential consequence is that the negative imagery of obesity portrayed in the warning label could perpetuate existing obesity stigma. Prejudice towards individuals with overweight and obesity is widespread (15), and it is possible that these graphic warning labels could exacerbate anti-fat prejudice by over-emphasizing the role that personal responsibility plays in the development and maintenance of obesity. Despite evidence that obesity is largely a result of environmental and biological factors (16), people with obesity are often considered to be personally responsible for their condition (17), and this 'blame' has been linked to

prejudice towards those individuals (18). Furthermore, people with overweight and obesity commonly face stigma and discrimination because of their weight (19), and experiencing stigma is associated with a range of harmful health and well-being consequences (20,21), including a greater risk of developing obesity (22) and an increased risk of mortality over and above the effects of body mass index (BMI) and indicators of poor health (23).

Public health campaigns aimed at dietary behaviour change have often been criticized for stigmatizing obesity, and these stigmatizing campaigns are also rated as the least motivating (24). The aim of the current research was to test the hypothesis that the graphic warning label used in a recent field study (14) promotes weight bias and is also viewed as stigmatizing by people with overweight and obesity. Study 1 aimed to first replicate the finding that the graphic warning label reduces intentions to purchase sugar-sweetened beverages (14) and to test the hypothesis that the label increases weight bias and disgust towards people with obesity. Study 2 examined whether the graphic warning label is perceived as stigmatizing by those who themselves identify as 'overweight' or 'obese' and whether the label negatively impacts mood and state self-esteem. Both studies were conducted in late 2018 and received ethical approval. The design and methods of all studies reported in this paper were preregistered, and the data have been made publicly available at <https://osf.io/jzr6h/>.

Study 1

Method

Participants and procedure

Participants were residents of the USA and were recruited from Amazon's Mechanical Turk. A pilot study provided the expected effect size on disgust ($d = 0.24$), and the current study was powered to detect an effect of this size. After excluding participants who failed attention checks or guessed the study hypotheses ($n = 140$, as determined by two independent raters; $K = 0.87$), the final sample consisted of 681 participants ($M_{\text{age}} = 41.38$, $SD_{\text{age}} = 12.69$; $M_{\text{BMI}} = 26.34$, $SD_{\text{BMI}} = 6.34$; 51% male; 80% White/Caucasian; 75% completed at least some university or college).

Participants were randomly allocated to one of two conditions: a warning label condition ($n = 324$) or a control condition ($n = 357$). All participants were asked to select their preferred brand of soda from a list of the most popular non-diet sodas within the USA and were then asked to imagine that they were at a cafeteria and were selecting a drink when they saw their preferred soda in the drinks

fridge. Participants in the warning label condition were then shown their preferred soda brand logo with the graphic warning label underneath (Figure 1). The warning label read 'WARNING: Drinking beverages with added sugar(s) contributes to: OBESITY, DIABETES, TOOTH DECAY' and was accompanied by three images: the bare stomach of man with obesity, a woman injecting herself and decaying teeth. Participants in the control condition were simply shown their preferred soda brand logo on its own. Participants in the two conditions did not differ on any demographic variables ($p_s > 0.187$). Participants then completed the following measures in order before being provided with a debriefing statement.

Measures

Purchasing decision. Following Donnelly *et al.* (14), participants rated their purchasing intentions after seeing the label: 'You are now deciding what drink to buy to have with your lunch at the cafeteria. You have two choices: [preferred soda] or water. Please indicate which of these two drinks you are inclined to buy' with a response scale from 1 = *definitely [preferred soda]* to 7 = *definitely water*.

Obesity stigma. Two measures were used to assess weight stigma:

Disgust towards people with obesity. Participants were asked to indicate the extent to which they feel disgusted/grossed out/repulsed/sickened by people with obesity (1 = *not at all*; 7 = *very much so*; $\alpha = 0.98$).

Universal Measure of Bias. Participants completed the Universal Measure of Bias (25), a scale that can be adapted to assess bias towards a variety of groups, including people with obesity. The measure uses a 1 (*strongly disagree*) to 7 (*strongly agree*) response scale and contains four subscales: negative judgment (e.g.

'Obese people tend toward bad behavior'), social distance (e.g. 'I don't enjoy having a conversation with an obese person'), (un)attraction (e.g. 'Obese people are a turn-off') and denial of equal rights (e.g. 'Special effort should be taken to make sure that obese people have the same rights and privileges as other people', reverse scored). Each subscale score ($\alpha_s > 0.82$) and the total score ($\alpha = 0.93$) were used in the current study as measures of bias towards people with obesity, with higher scores indicating greater bias.

Demographics. Participants indicated their sex, age, height, weight, ethnicity and level of education.

Habitual sugar-sweetened beverage consumption.

After completing the demographic measures, participants were asked 'How often do you drink sugary drinks? (e.g., regular soda, sports drinks, sweetened teas, juice drinks. Do not include diet or sugar-free drinks)', with a response scale from 1 (*never/almost never*) to 9 (*3 or more times per day*) (14).

Statistical analysis

Independent groups *t*-tests examined whether the graphic warning label reduced intentions to purchase the soda and increased weight stigma. Bootstrapped mediation analyses then examined whether the label impacted weight bias through increased disgust. All bias-corrected bootstrapped confidence intervals (CIs) are reported at the 95% confidence level.

Results

Participants who were presented with the graphic warning label were more likely to intend to purchase water (instead of the soda) than participants who were presented with the



Figure 1 Graphic warning label that was placed underneath the soda label in the experimental condition of Study 1 and in both conditions of Study 2.

Table 1 Means for each condition and comparison between conditions on primary outcome variables, Study 1

Outcome variable	Warning label (<i>n</i> = 324)		Control (<i>n</i> = 357)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Intention to purchase water	5.19	2.09	4.13	2.23
Disgust	2.95	1.88	2.57	1.65
Universal Measure of Bias total	3.60	1.07	3.43	1.04
Negative judgment	3.11	1.31	2.95	1.28
Social distance	3.19	1.24	3.00	1.18
Unattractiveness	5.13	1.27	4.94	1.29
Denial of equal rights	2.96	1.45	2.83	1.48

standard label, $t(678.29) = -6.38$, $p < 0.001$, $d = 0.49$ (refer to Table 1 for descriptive statistics for all outcome variables across conditions). The graphic warning label also increased disgust towards people with obesity, $t(646.92) = -2.76$, $p = 0.006$, $d = 0.21$, and overall bias towards people with obesity, $t(679) = -2.11$, $p = 0.035$, $d = 0.16$. Examining the subscales of the Universal Measure of Bias, the graphic warning label increased the desire for social distance from people with obesity, $t(679) = -2.12$, $p = 0.034$, $d = 0.16$, and led to greater endorsement that people with obesity are unattractive, $t(679) = -2.00$, $p = 0.046$, $d = 0.15$. However, the warning label did not significantly affect negative judgment, $t(679) = -1.62$, $p = 0.105$, $d = 0.12$, or denial of equal rights, $t(679) = -1.14$, $p = 0.255$, $d = 0.09$.

PROCESS (26) models were conducted to test whether disgust mediated the effect of condition on weight bias. The graphic warning label (relative to control) indirectly predicted higher levels of negative judgment ($b = 0.18$, $SE_{boot} = 0.07$, CIs [0.06, 0.31]), social distance ($b = 0.17$, $SE_{boot} = 0.06$, CIs [0.05, 0.29]), unattractiveness ($b = 0.15$, $SE_{boot} = 0.05$, CIs [0.04, 0.25]) and overall bias ($b = 0.15$, $SE_{boot} = 0.06$, CIs [0.04, 0.26]) towards people with obesity, as well as denial of equal rights ($b = 0.11$, $SE_{boot} = 0.04$, CIs [0.03, 0.19]), through increased disgust.

Neither participant BMI nor habitual sugar-sweetened beverage consumption significantly moderated the effect of condition on any outcome variable ($ps > 0.075$). Controlling for the demographic variables (sex, ethnicity: White or non-White, age and level of education) did not change the pattern of results except that the warning label now significantly increased negative judgment towards people with obesity relative to control, $F(1, 675) = 4.10$, $p = 0.043$. Including all participants who had been excluded prior to analysis did not change the pattern of results except that the significant effect of condition on the desire for social distance subscale was no longer statistically significant, $t(819) = -1.89$, $p = 0.059$, $d = 0.13$.

Discussion

Study 1 provided evidence that the graphic warning label can reduce intentions to purchase sugar-sweetened beverages. However, as hypothesized, the warning label also had a small but significant effect on increasing disgust towards people with obesity. Moreover, the warning label increased weight bias, both directly and indirectly through disgust. Although the effects are small, they emerged from a single brief exposure to the warning label in a hypothetical situation. Implementing a widespread policy in which graphic warning labels are mandated on all sugar-sweetened beverages across a district is likely to have a more substantial impact.

Study 2

Study 2 examined perceptions of the graphic warning label from the perspective of individuals who themselves identify as either 'overweight' or 'obese'. It was hypothesized that participants would perceive the label to be stigmatizing. In addition, Study 2 examined whether exposure to the warning label would impact mood and state appearance self-esteem and overall self-esteem. Participants who were exposed to the graphic warning label were expected to report greater negative mood and lower positive mood, as well as poorer appearance self-esteem and overall self-esteem. Study 2 also explored whether exposure to the label would indirectly influence self-esteem through changes in positive and negative mood.

Method

Participants and procedure

Participants were 561 individuals from the USA who were recruited via MTurk and who had identified as either 'overweight' or 'obese' in a pre-screening demographic survey. There was no prior basis for estimating the size of the effects on mood and self-esteem, so the decision was made based on available resources and enough power (80%) to detect a small-to-moderate effect size of $d = 0.25$. Participants were randomly assigned to one of two conditions. In the experimental condition, participants were shown the graphic warning label used in Study 1 and rated how stigmatizing they perceived it to be, both personally and in general towards people with obesity. Participants were then asked to complete measures of mood and self-esteem. Participants in the control condition completed the mood and self-esteem measures prior to being shown the graphic warning label and were then also asked how stigmatizing they perceived the label to be. After

excluding 55 participants for failing the quality control checks (as determined by two independent raters; $K = 0.65$), the sample consisted of 506 participants (control = 258, experimental = 248; $M_{\text{age}} = 41.37$, $SD_{\text{age}} = 11.55$; $M_{\text{BMI}} = 35.00$, $SD_{\text{BMI}} = 8.49$; 66% female; 82% White/Caucasian; 71% completed at least some university or college). Despite random allocation to conditions, participants in the control condition were significantly older ($M_{\text{age}} = 42.72$, $SD = 11.58$) than were participants in the experimental condition ($M_{\text{age}} = 39.97$, $SD = 11.36$), $t(504) = 2.69$, $p = 0.007$.

Measures

Perceived personal stigma. One item assessed the extent to which participants felt personally stigmatized by the label, with a response scale of 1 = *not at all*, 2 = *a little bit*, 3 = *somewhat*, 4 = *very much* and 5 = *extremely*.

Perceived obesity stigma. Participants rated the warning label for how stigmatizing they perceived it to be towards people with obesity with seven items adapted from Puhl *et al.* (27). Example items include 'This label stigmatizes obese persons' and 'This label promotes negative stereotypes about obese persons' (1 = *strongly disagree*, 7 = *strongly agree*; $\alpha = 0.94$).

Mood. Participants were asked to rate the extent to which they felt 10 different emotions in the moment. Five items were averaged and used as an indicator of positive mood (hopeful/happy/grateful/proud/confident; $\alpha = 0.90$), and five items reflected negative mood (angry/sad/anxious/ashamed/embarrassed; $\alpha = 0.88$). All items used a response scale of 1 = *not at all* to 5 = *extremely*.

State self-esteem. Participants completed the State Self-Esteem Scale (28), a 20-item measure of self-esteem felt in the moment. The State Self-Esteem Scale contains three subscales: appearance self-esteem (e.g. 'I am pleased with my appearance right now'), social self-esteem (e.g. 'I feel concerned about the impression I am making', reverse scored) and performance self-esteem (e.g. 'I feel like I'm not doing well', reverse scored), with a response scale from 1 = *not at all* to 5 = *extremely*. A sum score of the appearance self-esteem subscale ($\alpha = 0.87$) and the total self-esteem scale ($\alpha = 0.93$) was calculated for analyses.

Statistical analysis

Descriptive statistics illustrated whether participants perceived the graphic warning label to be stigmatizing. Independent groups *t*-tests investigated the hypothesis that

the warning label impacted mood and self-esteem, relative to control. Bootstrapped mediation analyses examined whether the warning label indirectly influenced self-esteem through changes in mood.

Results

The majority of participants rated the warning label as personally stigmatizing, with 69.2% ($n = 350$) rating it as at least 'a little bit' stigmatizing and 44.7% ($n = 226$) rating it as at least 'somewhat' stigmatizing ($M = 2.42$ out of 5, $SD = 1.25$). The majority of participants (65.6%, $n = 332$) also rated the label as stigmatizing towards people with obesity (i.e. scored above 4 on the 7-point Likert scale), and the mean stigma rating was 4.56 ($SD = 1.63$).

Participants in the experimental (post-exposure) condition reported greater negative mood, $t(483.98) = -2.88$, $p = 0.004$, $d = 0.26$, and lower positive mood, $t(491.56) = 4.09$, $p < 0.001$, $d = 0.36$, than did participants in the control (pre-exposure) condition (see Table 2 for descriptive statistics across conditions). There was no significant difference between conditions on appearance self-esteem, $t(504) = 1.18$, $p = 0.238$, $d = 0.10$, or overall self-esteem, $t(504) = 1.51$, $p = 0.133$, $d = 0.13$.

Two parallel mediation models were conducted in which condition predicted appearance self-esteem (model 1) and overall self-esteem (model 2) via positive and negative mood simultaneously. Participants exposed to the graphic warning label indirectly reported lower appearance self-esteem than did participants who had not been exposed to the label via lower positive mood ($b = -0.93$, $SE_{\text{boot}} = 0.24$, CIs $[-1.43, -0.51]$) and higher negative mood ($b = -0.34$, $SE_{\text{boot}} = 0.13$, CIs $[-0.63, -0.12]$). The (unique) indirect effect through positive mood was significantly larger than the indirect effect through negative mood ($b = 0.59$, $SE_{\text{boot}} = 0.23$, CIs $[0.19, 1.07]$). Exposure to the warning label was also indirectly associated with lower overall self-esteem, relative to control, through lower positive mood ($b = -1.96$, $SE_{\text{boot}} = 0.51$, CIs $[-3.02, -1.01]$) and higher negative mood ($b = -2.10$, $SE_{\text{boot}} = 0.75$, CIs $[-3.58, -0.65]$).

Table 2 Means for each condition and comparison between conditions on primary outcome variables, Study 2

Outcome variable	Warning label ($n = 248$)		Control ($n = 258$)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Negative mood	1.89	0.97	1.66	0.82
Positive mood	2.45	1.09	2.82	0.96
Appearance self-esteem	13.99	5.31	14.53	5.04
Overall self-esteem	64.92	15.70	66.96	14.79

and both indirect effects were of equal magnitude ($b = -0.14$, $SE_{boot} = 0.74$, CIs $[-1.62, 1.29]$).

The hypotheses related to self-esteem focused only on effects of exposure to the warning label on appearance and overall self-esteem; however, exploratory analyses examined whether exposure impacted the additional self-esteem subscales (performance self-esteem and social self-esteem). Exposure did not impact performance self-esteem (warning label: $M = 27.10$, $SD = 5.30$, control: $M = 27.19$, $SD = 5.10$), $t(504) = 0.18$, $p = 0.854$, $d = 0.02$; however, exposure to the graphic warning label significantly reduced social self-esteem ($M = 23.83$, $SD = 7.50$) relative to the control condition ($M = 25.24$, $SD = 6.91$), $t(504) = 2.21$, $p = 0.028$, $d = 0.20$.

Neither BMI nor self-identified weight category moderated the effect of condition on any outcome variable ($ps > 0.34$). However, participants who self-identified as having obesity rated the warning label as more personally stigmatizing ($M = 2.72$, $SD = 1.34$) than did participants who self-identified as having overweight ($M = 2.18$, $SD = 1.11$), $t(433.87) = -4.83$, $p < 0.001$, $d = 0.44$. Participants who self-identified as having obesity were also more likely to rate the label as at least 'somewhat' personally stigmatizing (55%) than were participants who self-identified as having overweight (38%), $\chi^2 = 14.98$, $p < 0.001$. Participants who identified as having obesity also rated the warning label as more stigmatizing towards people with obesity in general ($M = 4.74$, $SD = 1.70$) than did participants who identified as overweight ($M = 4.41$, $SD = 1.57$), $t(504) = -2.28$, $p = 0.023$, $d = 0.20$. The effect of the warning label on negative and positive mood remained when controlling for BMI ($ps < 0.004$) and self-identified weight category ($ps < 0.002$). Given that participants in the two conditions differed in age, the effects of condition were examined when controlling for age; the effects on positive and negative mood remained significant ($ps < 0.012$). Controlling for sex and ethnicity also did not change the pattern of results. Moreover, habitual sugar-sweetened beverage consumption did not significantly moderate the effect of condition on any outcome variable ($ps > 0.337$). Including all participants who had been excluded did not change the pattern of results except that the warning label now significantly reduced overall self-esteem relative to the control condition, $t(559) = 2.04$, $p = 0.042$, $d = 0.17$.

Discussion

The majority of participants felt that the label was personally stigmatizing and that it stigmatized people with obesity. Although not everyone felt personally stigmatized by the label, participants who self-identified as having obesity (and were thus more directly targeted by the

graphic warning label) were more likely to perceive the label to be personally stigmatizing, with more than half of these participants rating the label as 'somewhat', 'very much' or 'extremely' personally stigmatizing. Exposure to the graphic warning label also increased negative mood and reduced positive mood, and these changes in mood in turn predicted poorer state appearance self-esteem and overall self-esteem. Although exposure to the label did not directly worsen self-esteem, the mediation findings suggest that the label has the potential to impact self-esteem to the extent that it leads to changes in mood.

General discussion

The present studies provide initial evidence that this graphic warning label, with its negative imagery of obesity, promotes prejudice and disgust towards people with obesity. Moreover, people who themselves identified as having overweight or obesity reported feeling stigmatized by the warning label and, after being exposed to the label, experienced worse mood. To the extent that they experienced worse mood after viewing the graphic warning label, they also reported lower state self-esteem.

The effects of exposure to the graphic warning label on weight bias and mood are small, with the largest effect found for positive mood ($d = 0.36$). Moreover, the graphic warning label did not directly impact self-esteem, instead indirectly reducing both appearance-based and overall self-esteem through worsened mood. However, these small and indirect effects resulted from a mere single exposure to the warning label in an online, hypothetical scenario paradigm. If a widespread policy is implemented with the graphic warning label tested here (and in the Donnelly *et al.* field study (14)), repeated exposure to the label will be inevitable by people of all weight categories. Given that previous research has found that more frequent experiences of weight stigma are associated with more negative outcomes (29), widespread dissemination of these types of warning labels would likely result in more lasting negative consequences; however, this is yet to be empirically tested. Nevertheless, the present studies show that a single exposure to the graphic warning label can promote small changes in weight bias and that the label is perceived as stigmatizing by those with overweight. There is extensive evidence that weight stigma is associated with a range of harmful health and well-being consequences (20,21), including reduced health motivation (19), increased caloric consumption (30), weight gain (31) and increased risk of mortality (23). Therefore, the health-promoting effects of the graphic warning label with regard to curbing sugary drink purchasing (14) must be balanced against the potential health-degrading consequences of a

label that may promote weight stigma (cf. Azevedo and Vartanian (32)). It will be important for future research to more directly examine the impact of exposure to the graphic warning label on health outcomes (i.e. health motivation and caloric consumption) to better inform policy decisions.

Public policy implications

In 2015, the City of San Francisco passed a law requiring that soda advertisements include a text label that warned of three negative health consequences of drinking sugar-sweetened beverages: obesity, diabetes and tooth decay (4). A field study found that this label was ineffective in reducing sugary drink purchasing when placed at the point of sale (14). However, a graphic warning label version (which included three images: the bare stomach of an obese man, a person injecting themselves and rotting teeth) reduced purchasing by 14.8%. The present studies provide the first evidence that, despite this graphic warning label's effectiveness in reducing soft drink purchasing, it also appears to promote disgust and prejudice towards people with obesity and is perceived as stigmatizing by those who identify as overweight or obese. Given the substantial evidence that weight stigma is associated with negative health consequences (19–22) including increased risk of mortality (23), these findings suggest that policymakers should pause before deciding to promote the widespread implementation of such a graphic warning label. It is possible that the public health benefits of this intervention could outweigh the costs but more research is needed before such a conclusion is drawn. Creators of public health interventions need to consider the ethical implications of the interventions they endorse. Similar arguments have been made in the context of anti-smoking campaigns and the promotion of lung cancer stigma, with some suggesting that creators of interventions are ethically responsible for minimizing the stigmatizing impact of the campaigns that they promote (33). Indeed, there is evidence that anti-smoking campaigns have increased the stigmatization of smoking (34) and while some have argued that this has increased their effectiveness (34), others have provided evidence of unintended negative consequences for smokers who have internalized this stigma (35).

Going forward, it will be important to develop and test the effectiveness of warning labels that do not promote obesity stigma. There is evidence that public health campaigns that are perceived as the most motivating are those that do not mention obesity or body weight at all but instead focus on the healthy behaviours that they are trying to promote (24). Some researchers (27,36) have suggested that public health interventions should focus

on health as the primary motivator and desired outcome for behaviour change and avoid messages that emphasize an 'ideal' body weight. Future research should test the effectiveness of warning labels that do not contain obesity-specific language on sugary drink consumption.

Limitations and future directions

There are limitations to the current research. All of the current studies were conducted online, and self-report measures were used to assess all outcomes. Further research is therefore needed to examine whether viewing graphic warning labels such as the one tested here leads to greater discrimination against people with obesity. Regardless of whether the warning label increases weight bias among the general population, however, Study 2 showed that many people with overweight and obesity feel personally stigmatized by the label and exposure to the label negatively affected mood and indirectly reduced self-esteem. Only one of the three health consequences listed in the graphic warning label (obesity) was addressed in the current studies. There were a number of reasons for choosing to focus on obesity: a relatively large proportion of the population have obesity (more than one-third of adults in the USA (37)) and are at risk of feeling personally targeted by these labels; the stigma of obesity is widespread (15,38,39); and there is a large evidence-base documenting the negative consequences of weight stigma (19,20,22,23,30). It is possible, however, that the label has additional unintended consequences, such as exacerbating stigma towards people who suffer from diabetes (40), particularly Type 1 diabetes (which has no known links with modifiable lifestyle factors), and this should be examined in future studies. Furthermore, it will be important for future research to examine whether graphic warning labels that do not contain imagery of obesity can be effective in promoting healthy behaviours (e.g. if they focus on specific health outcomes of poor dietary behaviour such as coronary heart disease) (3).

Conclusions

Our findings highlight the need to consider the potential unintended consequences of public health campaigns such as whether they promote obesity stigma. Given the substantial evidence that weight stigma is associated with poor health outcomes, including increased likelihood of obesity (22) and increased mortality risk (23), the current findings are concerning and should give researchers and policymakers alike pause for thought. Future research on graphic warning labels should not only examine their effectiveness in reducing sugar consumption but also assess the stigmatizing impact of the intervention.

It is important for policymakers to strike a balance between the benefits and costs of public health interventions, and evidence suggests that obesity stigma may have significant costs.

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Conflict of Interest Statement

No conflict of interest was declared.

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