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DOI:
10.1111/nbu.12371

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (Harvard):
Higgs, S, Liu, J, Collins, EIM & Thomas, JM 2019, 'Using social norms to encourage healthier eating', *Nutrition Bulletin*, vol. 44, no. 1, pp. 43-52. https://doi.org/10.1111/nbu.12371

Nutrition Bulletin

EMERGING RESEARCH DOI: 10.1111/nbu.12371

Using social norms to encourage healthier eating

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Abstract

What and how much people choose to eat is influenced by social context. People tend to use the eating habits of others as a guide to appropriate consumption. This suggests that one way of encouraging healthier eating would be to provide information about the healthy eating choices of others. Research conducted as part of an Economic and Social Research Council-funded project investigated the effect of providing information about how others eat on the purchase and consumption of vegetables in both laboratory and in field settings (restaurants). In a laboratory-based study, we found that that while overall vegetable intake was not increased, exposure to a novel 'liking norm' message increased the selection and intake of broccoli from a buffet by participants who were low habitual consumers of vegetables. We also found that the liking norm increased broccoli intake even when there was a delay between exposure to the message and selection at the buffet, suggesting that the effects of social message exposure may persist beyond initial exposure. In two online studies and a laboratory study, we found that the effect of exposure to a descriptive social norm message on eating intentions and intake was moderated by the participants' motivation to identify with the norm referent group. In three intervention studies, exposure to social norm messaging was associated with increased purchases of meals with vegetables in restaurant settings. Taken together, these results suggest that it is feasible to use social norm messages in restaurant settings and they provide information that could be used to implement randomised controlled trials.

Keywords: food choice, food intake, healthy eating, interventions, social norms, vegetables

Introduction

Making healthful food choices is not easy in an environment in which nutrient-poor and high-calorie foods are highly visible and easily available (Swinburn *et al.* 2011). Many people in industrialised countries consume a diet that is high in sugar and fat and low in fruit and vegetables (*e.g.* Kimmons *et al.* 2009; Krebs-Smith *et al.* 2010; Mindell *et al.* 2012; Bates *et al.* 2014). This dietary pattern is associated with chronic diseases such as type 2 diabetes, some cancers and cardiovascular disease (Sarkar *et al.* 2018), whereas consuming the recommended amount of vegetables has been associated with reduced risk of cardiovascular disease (Hu *et al.* 2014) and type 2 diabetes (Carter *et al.* 2010). Therefore, developing

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interventions to encourage people to adopt more healthful dietary patterns is an international priority.

Many approaches to encouraging healthier eating patterns have focused on providing education via public information campaigns (Rekhy & McConchie 2014). Although these interventions appear to be effective in altering attitudes and intentions towards healthy eating, assessment of the effectiveness of such campaigns on actual behaviour has been limited and the available data suggest that the effect sizes are small and inconsistent (Rekhy & McConchie 2014; Appleton *et al.* 2016). More recently, attention has shifted towards developing healthier eating interventions that alter aspects of the environment, to nudge behaviour in a healthier direction, rather than educate people (Bucher *et al.* 2016; Hollands *et al.* 2017). One aspect of the environment that is known to exert a powerful influence on food intake and food choice is the social context in which eating occurs (Herman *et al.* 2003).

Many decades of research have demonstrated that what and how much people eat is influenced by perceptions of the eating habits of others (for recent reviews see Higgs 2015; Higgs & Thomas 2016). People look to others as a guide for how much to eat and the presence of other people in eating situations can guide food selection (Herman *et al.* 2003; Cruwys *et al.* 2015). This suggests that one way of encouraging healthier eating is to provide information about the eating habits of others via social norm-based interventions.

Social norm-based interventions have been developed to encourage the adoption of health promoting behaviours such as stair climbing and sun cream use and reduced alcohol and tobacco consumption (Perkins 2002; Linkenbach & Perkins 2003; Mahler *et al.* 2008; Burger & Shelton 2011). For example, informing students at university that most students do not engage in risky consumption of alcohol has brought about reductions in alcohol consumption on campuses in the US (Perkins 2002). This strategy is based on the idea that students have an exaggerated view of how much other students are drinking and they conform to this misperception in their own drinking habits. By reducing the misperception, via the provision of social norm messages communicating actual consumption, subsequent alcohol consumption is reduced. However, until recently, few studies had investigated the potential of social norm-based interventions to promote healthy eating.

Research conducted as part of an Economic and Social Research Council (ESRC)-funded project at the University of Birmingham adopted a translational approach to developing a social norm-based intervention aimed at encouraging healthier eating. The target behaviour was the consumption of vegetables. This review summarises some of the key outcomes of the project, which aimed to (1) establish the effectiveness of social norm messages on selection of vegetables; (2) investigate the moderators and mediators of the effects of social norm messages on food selection; and (3) test the feasibility of a social norm intervention to increase the purchase of vegetables. We also highlight directions for future research.

Social norms and their influence on eating

Who we eat with has a powerful effect on what we choose to eat and how much we eat. The presence of other people at an eating occasion can either facilitate or inhibit food intake compared to when eating alone. For example, both adults and children tend to eat more when eating with someone who is consuming a large amount and eat less when with someone eating a small amount, relative to when they are eating alone (*e.g.* Bevelander *et al.* 2012; Robinson *et al.* 2013a). In addition, there is evidence that people model the food choices of others (Prinsen *et al.* 2013; Robinson & Higgs 2013). Two systematic reviews of a large literature have provided evidence that modelling of eating behaviour is an extremely robust phenomenon (Cruwys *et al.* 2015; Vartanian *et al.* 2015). It has been argued that social context affects eating because the behaviour of other people provides a guide or norm for appropriate eating (Herman *et al.* 2003). As social creatures we tend to conform to these norms because we find it rewarding to do so (Higgs 2015).

Eating choices are not only affected by other people who are present at an eating occasion, but also by our knowledge of how people with whom we are socially connected eat. In other words, our understanding of what and how much our friends and family and wider social networks eat affects our own dietary patterns. Evidence from large-scale surveys of self-reported food intake (*e.g.* Pelletier *et al.* 2014; Pedersen *et al.* 2015) and social network analysis suggest that eating patterns converge among spouses, other family members and friends (*e.g.* Pachucki *et al.* 2011; De La Haye *et al.* 2013). If we are friends with people who eat unhealthily, then we are also more likely to make unhealthy food choices (Mötteli *et al.* 2017).

A prediction that arises from the data on social influence on eating is that providing normative information on the healthy eating patterns of other people

might be helpful in promoting healthful food choices. We tested this idea in a series of laboratory-based studies and found that informing students about the relatively high vegetable consumption of other students increased choice of vegetables at a later meal for participants who were low habitual consumers of vegetables (Robinson *et al.* 2014). Specifically, in the first study, we told students that we were developing some educational materials for display around the university campus and that we would like them to provide an evaluation of some posters and flyers. This allowed us to expose the students to a message about the vegetable eating habits of their fellow students ['Did you know most students eat a lot more vegetables than you might realise? Although, a lot of people aren't aware, the typical student eats over three servings of vegetables each day (according to a 2011 study)'] or a control message that emphasised the health benefits of eating vegetables ['Eating a lot of vegetables is good for your health. A lot of people aren't aware that heart health and cancer risk can be improved by eating over three servings of vegetables each day (according to a 2011 study)']. Once the students had provided some ratings about the posters, we then asked whether they would be willing to take part in another study (conducted by a different experimenter) about the effects of food on mood. The reason for the cover story was to reduce the likelihood that participants guessed that we were interested in the effects of exposure to the posters on their selection of food from a buffet. We found that participants in the social norms poster condition who were low habitual consumers of vegetables selected and consumed more vegetables from the buffet than did low consumers in the health control condition (Robinson *et al.* 2014). There was no effect of poster condition for the participants who were high habitual consumers of vegetables, presumably because they were already behaving in line with the norm. These data are important because they suggest a means of specifically targeting consumers who would most benefit from incorporating more vegetables into their diet (*i.e.* low consumers who are often resistant to other types of healthy eating interventions that focus on providing information on the health benefits of healthier eating) (McGill *et al.* 2015).

Other similar studies have reported that social norm-based messages are effective in reducing actual intake of 'junk' food in adults in the laboratory (Robinson *et al.* 2013b) and can promote the consumption of vegetables by children (Sharps & Robinson 2016). In addition, it has been reported that a social norm intervention targeting fruit and vegetable intake resulted in an increase in skin carotenoids, an indicator of carotenoid-containing fruit and vegetable intake over 8 weeks (Wengreen *et al.* 2017). However, the long-term effects of social norm messages on actual intake have yet to be firmly established, since most laboratory-based studies have examined intake immediately after exposure to the norm. In addition, there are issues around the formulation of the social norm messages that need to be considered if social norm messaging is to be developed for larger scale interventions. In particular, if the target behaviour is actually performed at a low level, intake may only be increased for consumers who are well below the norm, and there may even be an adverse effect on those who are eating above the norm. Therefore, the first aim of our project was to examine the effectiveness of different types of social norm messages on food selection and to examine whether the effects of exposure to the norm messages are sustained over a 24-hour delay between exposure to the message and a consumption opportunity.

Types of social norm messaging and food selection

Descriptive social norms describe how people behave (*e.g.* 'Most people eat healthily'), while injunctive social norms reflect the approval of certain behaviours (*e.g.* 'Most people endorse healthy eating'). Most research to date on the effect of norm messaging on eating behaviours suggests that injunctive norms have less of an effect on eating behaviour than do descriptive norms (Lally *et al.* 2011; Mollen *et al.* 2013; Robinson *et al.* 2014; Stok *et al.* 2014a). This may be because most people approve of eating fruit and vegetables even if they do not eat many vegetables; hence, there may be a limited capacity to further change this attitude. These data suggest that descriptive norms are likely to be most effective in promoting healthier eating. However, in the case of healthy eating, the descriptive norm is likely to be a minority norm because most people do not actually eat at the recommend level. The use of messages conveying a minority norm (*e.g.* '30% of people eat the recommended amount of fruit and vegetables per day') runs the risk that people who are already consuming at the norm may reduce their intake to be in line with the norm, which is not a desirable outcome. Therefore, alternative messaging needs to be developed. One approach is to base the descriptive norm message on self-reported data (which usually overestimate actual consumption

levels) about vegetable consumption (Robinson *et al.* 2014). However, if there is a large discrepancy between the information displayed in the message and people's perception of what is actually the case, then such messages may not be believed. Another approach, which has been found to increase intentions to consume vegetables, is to describe the number of people who are trying to engage in a healthy behaviour (*e.g.* 'Most people try to eat five servings of fruit and vegetables a day') rather than the number of people who actually succeed (Croker *et al.* 2009). More recently, it has also been found that dynamic norms, which are norms describing how a behaviour of a group is changing over time, might also be effective in encouraging behaviour that is contrary to a current norm (Sparkman & Walton 2017).

A novel alternative to norms that describe the prevalence or approval of a behaviour is a norm that describes how much enjoyment people derive from engaging in a particular behavior. When it comes to food choice, such information may be influential since liking is a strong predictor of future eating behaviour (de Graaf *et al.* 2005). In the case of healthy foods, we have reported that, contrary to what one might expect, liking for vegetables that have been chosen and eaten by people is generally high, perhaps reflecting that people do not generally choose foods they dislike and that most people can bring to mind a time when they enjoyed eating vegetables (Robinson *et al.* 2011a).

In a large randomised experiment, we tested whether a liking norm about vegetables would enhance the intake of vegetables by habitual low consumers of vegetables. The liking norm conferred neither what people do nor what they endorsed (descriptive and injunctive norms), but instead conveyed what people liked (*i.e.* 'Did you know more students like vegetables than you might realise? Although, a lot of people aren't aware, 80% of students actually like vegetables a lot'). We included three additional conditions: (1) a descriptive social norm condition; (2) a health-based condition; and (3) a condition that included information regarding the variety of vegetables that exist, but did not mention either the normative consumption or the health benefits of consuming vegetables. The vegetable variety condition was included so that we could examine the effect of mere exposure to the mention of vegetables. Each of these conditions was compared to a neutral condition that did not mention vegetables at all ('Did you know that the University of Birmingham is over 100 years old? According to a recent survey, most students prefer to study at a university with an established record'). We also examined whether any effects persisted beyond initial exposure to the message by examining food selection both immediately after exposure to the message and 24 hours after exposure to the message. Using a design similar to that used by Robinson *et al.* (2014), the study was set up to include two parts: a poster/flyer evaluation session followed by a food choice session that was presented as a separate study. The food choice session involved participants selecting from a buffet that included raw vegetables (broccoli, celery and cucumber) and high-calorie foods (crisps and crackers).

We found no effect of message condition on vegetable consumption overall, but examination of each vegetable individually showed that low habitual consumers of vegetables in the liking norm and vegetable variety conditions consumed significantly more broccoli compared with participants in the neutral condition in which information about the University of Birmingham was presented (Thomas *et al.* 2016). The same pattern of results was observed for broccoli intake when intake was assessed immediately after exposure to the message and when intake was assessed 24 hours later, providing evidence that the effects persist beyond initial exposure. As observed previously (Robinson *et al.* 2014), there were no effects of message condition on consumption of any of the vegetables for the high habitual consumers of vegetables and we observed no effects of message type on consumption of the high-calorie foods. The effect of the vegetable variety message to increase broccoli consumption was unexpected, but to some extent clarified by a *post hoc* study that asked a different group of participants about their perceptions of the poster messages. In this survey, participants thought that exposure to the vegetable variety message would increase how much people like vegetables, suggesting it may have been acting as an implicit liking norm message. Overall, these findings suggest that social norm-based messages about others' liking might be usefully employed to promote the consumption of vegetables.

Moderators of the effect of social norm messaging on food selection

Individual characteristics including hunger and satiety, gender, age, bodyweight and personal traits have been examined as potential moderators of following social norms (*e.g.* Goldman *et al.* 1991; Robinson *et al.* 2011b). The results of several systematic reviews

suggest that people align their behaviour to a social norm regardless of individual traits and hunger levels (Robinson *et al.* 2014; Cruwys *et al.* 2015; Vartanian *et al.* 2015). However, there is some evidence to suggest that eating norms are more likely to be followed if individuals and norm providers are similar in terms of gender (Conger *et al.* 1980), bodyweight (De Luca & Spigelman 1979; Rosenthal & McSweeney 1979; Hermans *et al.* 2008; McFerran *et al.* 2009), age (Hendy & Raudenbush 2000) or social relationship (Salvy *et al.* 2007; Howland *et al.* 2012; Kaisari & Higgs 2015). Hermans *et al.* (2008) examined whether the physical appearance of a same-sex model affected the imitation of eating behaviour. They found that lean female participants modelled eating behaviour only when their eating companion was also lean, but not when their eating partner was seen as underweight. It has also been reported that lean participants were not affected by the behaviour of a confederate who had obesity (Johnston 2002; McFerran *et al.* 2009). Furthermore, participants with obesity modelled food intake only in the presence of a confederate who also had obesity (De Luca & Spigelman 1979). One explanation for these findings is that when there are similarities between the norm provider (the referent group) and follower, the effect of the norm on the follower is enhanced (Louis *et al.* 2007; Higgs 2015). In support of this idea, identification with the referent group has been found to moderate norm following (Cruwys *et al.* 2012; Stok *et al.* 2014b). However, few studies have investigated whether manipulating identification with the referent group has an effect on norm-following behaviours. This is significant because manipulation of the strength of identity allows for stronger inferences to be drawn about the causal nature of the relationships between social norms for consumption, food intake and identification with the referent group.

It is important to establish whether identification with the referent group is a factor in norm following because there are implications for the design of norm-based interventions. For example, norm-based messages may be more effective if they refer to a relevant or similar social group. In this regard, an important distinction has been made in previous research between specific components of norm identification. Leach and colleagues proposed a hierarchical, multi-component model of in-group identification that distinguishes group-level self-definition (*i.e.* individual self-stereotyping and in-group homogeneity) from self-investment (solidarity, satisfaction and centrality). The dimension of 'group-level self-definition' indicates the extent to which people see themselves as similar to the group, and group members as similar to one another, whereas 'group-level self-investment' indicates the extent to which people find group membership motivationally significant (Leach *et al.* 2008).

We conducted three studies to further investigate the role of identification with the norm referent group in the response to social norm messaging. Two online studies examined whether the effect of a descriptive social norm message about vegetable intake (or limiting 'junk' food intake) on eating intentions was moderated by the extent to which participants identified with the norm referent group. Exposure to a descriptive social norm message, but not a health-related or control message, was associated with increased intentions to eat vegetables and increased intentions to limit 'junk' food intake, but only for participants who scored highly on a measure of how central the norm referent group was to their identity (self-investment in the norm). A laboratory-based study built on those findings by examining whether priming the social identity enhanced the effects of a descriptive social norm message on actual food intake in a laboratory setting. We found that intake of fruit and vegetables was enhanced after exposure to a descriptive social norm message (vs. a health message), but this effect was only significant for participants whose identification with the norm referent group had been primed (Liu *et al.* in press).

Taken together, these data add to the suggestion that acting in line with group norms is more likely when individuals regard their membership of the group as being important to their identity. More specifically, they suggest that self-investment in the norm referent group may be more important than self-definition as a group member in norm following. In other words, the moderating effect of identification with the norm may be driven by motivational components of social identity rather than perceived similarity with the group.

Mediators of social norm messaging on food selection

Understanding the mechanisms that underlie the effects of norm messages on food choices is important because there are implications for the effectiveness of norm interventions in the longer term. A person may decide to choose a healthy food option because that is the norm but if this choice is made only because that person wishes to be seen to conform, then this behaviour is unlikely to form the basis of an effective,

long-term intervention on behaviour change. Alternatively, if conformity to the norm has an effect to change perceptions or emotions in a positive manner, then this might be more likely to sustain behaviour change in the long run. It has been argued that social norms may influence eating behaviour by altering expected liking for a food (Higgs 2015), which could in turn alter actual liking (Cardello & Sawyer 1992). We might expect a food to taste good because we infer that other people with whom we identify are eating it and enjoying it. Supporting this idea, work by Robinson and Higgs (2012) reported that participants' expected liking for orange juice was influenced by the provision of social normative information on how well orange juice was liked by other students. However, in the study by Thomas *et al.* (2016), liking ratings for broccoli were not significantly affected by either the liking norm or vegetable variety condition, even though intake was greater in these conditions compared with the neutral condition. The lack of effect of the manipulations on liking ratings suggests that an immediate change in actual liking of the food was not a mediating mechanism. Another possibility is that conforming to a norm is a positive emotional experience more generally and people tend to shift their behaviour to be in line with a norm in order to gain this reward (Izuma & Adolphs 2013). Given that conformity to an eating norm is associated with increased activity in reward circuitry in the brain (Nook & Zaki 2015), it is plausible that repeated conformity might lead to enhanced liking and enjoyment of that food over time, although this remains to be tested.

Developing an intervention

An important aim of our project was to investigate whether the effects of social norm messaging on food choice translates into real-world dietary change. At the point of conducting our research, we were aware of one published study that had tested the effect of social norm messages on healthy eating in a restaurant setting. Mollen *et al.* (2013) explored the effect of displaying a healthy descriptive social norm message ['Every day more than 150 (name of university) students have a tossed salad for lunch here'] compared to a no message condition, a healthy injunctive norm ('Have a tossed salad for lunch!') and an less healthy descriptive norm ['Every day more than 150 (name of university) students have a burger for lunch here'] in a student restaurant. Mollen *et al.* (2013) reported that the healthy descriptive social norm message significantly increased the self-reported selection of salad over a hamburger option, although the analysis was restricted to a subset of customers who correctly identified to have been exposed to the norm message and those in the control condition. We aimed to build upon this initial work and establish whether social norm messages conveyed via posters have an effect on actual purchases [rather than just self-reported as in Mollen *et al.* (2013)] in three workplace restaurants. A pre-test/post-test design was used involving a baseline observation period of 2 weeks, followed by a 2-week intervention period in which the social norm message was displayed in the restaurants at the point of choice and on tables. We also had a post-intervention observation period where we assessed purchases when the posters had been removed. The message stated 'Most people here choose to eat vegetables with their lunch'. We found that displaying the social norm message was associated with an increase in the purchase of meals containing vegetables (assessed by cash register records). We further found that purchase of vegetables increased after the posters were removed in the post-intervention period. There was no change in purchases of a control item (water) over all phases of the study. These data confirmed the feasibility of using social norm-based messaging in the field and provided evidence to support the implementation of further controlled studies.

In two follow-on field studies, we aimed to conduct a randomised controlled trial to compare the effect of social norm messages with health messages, such as those commonly used in healthy eating campaigns (Collins *et al.* 2019). The first study focused on the observation of main meals containing vegetables as an integral ingredient and the second study examined the purchase of side portions of vegetables. For both studies, one site was randomly selected to display the social norm message and the other to display the health message. Within each site, observations were made during three stages that occurred in immediate succession: baseline, intervention (during which the posters were displayed) and post-intervention (when the posters were removed). Although our aim was to analyse the data according to a randomised control design, initial analyses indicated that there were substantial baseline differences between sites and so we analysed the data according to a pre-/post-test design within each site.

Across both studies, we observed that exposure to the social norm message was associated with an increase in vegetable purchases (Collins *et al.* 2019), which is consistent with the findings of Thomas *et al.* (2017). However, there were some differences across

studies. Specifically, in the first study reported by Collins *et al.* (2019), there was no difference in the number of meals purchased with vegetables during the intervention vs. the post-intervention stage (*i.e.* the effect was sustained from intervention to post-intervention), but the removal of the social norm posters was associated with a decrease in purchases of side portions of vegetables in the second study, which contrasts with the findings of Thomas *et al.* (2017). The reason for the lack of consistency of effects in the post-intervention period is unclear but may relate to differences across studies including the exact messaging used, the nature of the restaurants and clientele. In addition, in the second study reported by Collins *et al.* (2019), exposure to both the social norm and health message was associated with an increase in the purchase of side portions of vegetables, whereas only the social norm message was associated with an increase in main meals with vegetables observed in the first study. These data suggest that although health messages might be effective in some contexts, their effects may be more variable than those associated with social norm messaging.

Overall, while some caution is required in interpreting the results, the findings from the three field trials we conducted suggest that larger randomised controlled trials to test the effects of social norm interventions are warranted. Social norm interventions are cost effective to implement and have the potential to reach consumers who might benefit most from increasing their consumption of vegetables, such as those consuming low levels of vegetables, but will the potential effects be clinically relevant? Consumption of an additional vegetable serving per day has been associated with a 5% reduction in all-cause mortality (Wang *et al.* 2014). We observed a 5–10% increase in meals purchased with vegetables across our studies and so if interventions based on social norms were adopted more widely, then this could impact a substantial number of meals.

Future research

We recommend that further testing of social norm interventions to encourage healthier eating now focuses on conducting larger scale randomised controlled trials using multiple sites. Ideally, such trials should include a no-treatment control group (*e.g.* displaying posters with non-vegetable content, or no posters at all) as well as a comparison health message group to gauge the effectiveness of a social norm intervention vs. existing approaches. In addition, actual food consumption should be examined in the field to assess whether vegetables purchased with meals are consumed, and this could be measured either directly or indirectly (*e.g.* wastage could be evaluated as a proxy). If the effectiveness of the social norm message is confirmed, subsequent work might investigate ways of optimising social norm interventions by testing the effects of different message types and possibly combining social norm interventions with other approaches to boost the effect size. For example, based on the results of Thomas *et al.* (2016), combining social norms text with images of vegetables might be more effective than text alone and a liking norm message might also be more effective than a descriptive norm message. Pilot studies might establish the most appropriate norm referent group based on assessment of centrality of identification with the norm [based on the results of Liu *et al.* (in press)] and incorporate some priming of social identity to enhance effectiveness of the norm messaging. The development of social norm-based interventions would also benefit from greater understanding of how and why they are effective in real-world settings so that this information might be used to refine the intervention.

The use of social norm messaging could also be extended to different locations such as non-workplace restaurants and schools and to different populations including children and adolescents. Adolescence is a period of life in which desires to be liked and 'fit in' to peer groups are high (Mwamwenda 1995) and so social norm interventions targeting this age group might be particularly effective. There is also the potential to use social norm messages to encourage other types of healthier eating including the selection of lower calorie options, smaller portions sizes or plant-based meals (see also Sparkman & Walton 2017; Christie & Chen 2018).

Summary and conclusions

As part of an ESRC-funded grant, we evaluated the feasibility of using a social norm intervention to promote the consumption of vegetables. Across three field studies, we found that exposure to social norm messaging was associated with increased purchases of vegetables with meals. We also conducted laboratory-based studies that aimed to provide data to underpin the refinement and development of future social norm-based interventions. We found that exposure to a novel 'liking norm' message (conveying how much other people enjoy eating vegetables) increased the selection and intake of broccoli from a buffet by participants who were low

habitual consumers of vegetables. In the same study, we also found that the liking norm was effective in increasing broccoli intake even when there was a delay between exposure to the message and selection at the buffet, suggesting that the effects of social norm messages persist beyond initial exposure, for at least 24 hours. The results of two online studies provided new evidence that exposure to descriptive norm messages is effective in both increasing intentions to consume more vegetables and decreasing intentions to consume less healthy foods especially when participants are strongly motivated to identify with the norm referent group. A laboratory-based manipulation study further found that priming identification with the norm increased the effectiveness of a social norms based message to increase consumption of vegetables. Taken together, these results provide the basis for future larger scale trials testing the use of social norm-based interventions to promote healthier eating.

Acknowledgements

Our research on social norms and eating described in this paper was funded by the Economic and Social Research Council (ESRC – ES/K002678/1). A summary of the project can be found at https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=852882.

Conflict of interest

All of the authors declare that they have no competing interests.

Author contributions

SH drafted the paper and all authors critically reviewed and improved it.

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