

## Social influences on eating

Higgs, Suzanne; Thomas, Jason

DOI:

[10.1016/j.cobeha.2015.10.005](https://doi.org/10.1016/j.cobeha.2015.10.005)

License:

Creative Commons: Attribution (CC BY)

*Document Version*

Publisher's PDF, also known as Version of record

*Citation for published version (Harvard):*

Higgs, S & Thomas, J 2016, 'Social influences on eating', *Current Opinion in Behavioral Sciences*, vol. 9, pp. 1-6. <https://doi.org/10.1016/j.cobeha.2015.10.005>

[Link to publication on Research at Birmingham portal](#)

**Publisher Rights Statement:**

Checked for eligibility: 08/01/2016

**General rights**

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

**Take down policy**

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact [UBIRA@lists.bham.ac.uk](mailto:UBIRA@lists.bham.ac.uk) providing details and we will remove access to the work immediately and investigate.

# Social influences on eating

## Suzanne Higgs and Jason Thomas

Eating behaviour is strongly influenced by social context. We eat differently when we are with other people compared with when we eat alone. Our dietary choices also tend to converge with those of our close social connections. One reason for this is that conforming to the behaviour of others is adaptive and we find it rewarding. Norms of appropriate eating are set by the behaviour of other people, but also shared cultural expectations and environmental cues. We are more likely to follow an eating norm if it is perceived to be relevant based on social comparison. Relevant norms are set by similar others and those with whom we identify. If a norm is relevant then there may be matching of behaviour to the norm, but this will depend on other factors, such as how much attention is paid to the norm, how concerned we are about social acceptance and the presence of other competing norms such as personal norms and consumption stereotypes. Norm matching involves processes such as synchronisation of eating actions, consumption monitoring and altered food preferences. There is emerging evidence that social eating norms may play a role in the development and maintenance of obesity. Social eating norms constitute a novel target for interventions to encourage healthier eating.

### Address

School of Psychology, University of Birmingham, United Kingdom

Corresponding author: Higgs, Suzanne ([s.higgs.1@bham.ac.uk](mailto:s.higgs.1@bham.ac.uk))

Current Opinion in Behavioral Sciences 2016, 9:1–6

This review comes from a themed issue on **Diet, behavior and brain function**

Edited by **Dana M Small** and **Susanne E la Fleur**

<http://dx.doi.org/10.1016/j.cobeha.2015.10.005>

2352-1546/© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### Introduction

Sharing a meal with friends, family or work colleagues is a common activity [1]. Given that much eating takes place in a social context it is important to understand how, and why, who we dine with affects what we eat. We know from decades of research that other people influence our food intake and choices in a variety of ways [2]. If we eat with someone who is eating a large amount then we are likely to model what they eat and consume more than we would eat if we were dining alone [3]. We are also likely to eat a large amount if we eat in a group rather than eating alone. Such ‘social-facilitation’ of eating has been well

documented with evidence from food diaries, observational and experimental studies [4]. On the other hand, we might eat less than usual if we think that eating a small amount will create a favourable social impression [5]. One reason why other people have such an influence on our eating is that they provide a guide or norm for appropriate behaviour [6]. There have been a number of studies published recently that have contributed to our understanding of the conditions under which social norms affect intake and the underlying mechanisms. There has also been interest in the relationship between social norms, dietary patterns and obesity. The aim of this review is to highlight developments in these areas and assess the potential for social norms to be harnessed in the promotion of healthy eating.

### Social norms and eating in the laboratory

According to a recent meta-analysis, modelling of eating is a robust phenomenon and the effect size on average is large [7]. Modelling occurs when the norm is set by another present person (i.e. another diner), but also when the model is not present, such as when the norm is communicated by environmental cues (e.g. by leaving empty wrappers on display as a sign of what other people have eaten) or by textual information (e.g. by providing a list of amounts eaten by supposed previous participants in a study). People may also model culturally agreed norms such as the norm that we eat more when we are in the company of friends than when we are alone [8].

Modelling occurs when co-eaters are known to each other or are strangers [9] and regardless of current hunger state, dieting status, current health goals or age [3,10]. Children model the eating of both their parents and peers [11,12] and the effects are similar to those seen for adults modelling other adults [7]. Nevertheless, there is variability in the effect sizes across studies [7] and the identification of potential moderators that might explain this variability has been a recent research focus.

### Moderators of social influence on eating

Women scoring low in impulsivity modelled intake in a naturalistic eating situation but no modelling was observed for women scoring high on impulsivity [13]. On the other hand, individuals low in self-control were more likely to follow perceived peer eating norms [14,15]. These results appear contradictory, but the study methods differed in a number of ways making them difficult to compare. It is also possible that unmeasured variables that are correlated with impulsivity account for the results, such as concern with behaving in a socially appropriate manner, which has been shown to enhance social influence on

eating [8,16]. Intake monitoring is an important factor in modelling and may be affected by impulsivity. Indeed, high impulsive women were less accurate in their estimations of the amount eaten by the other person, perhaps explaining why they did not model [13].

Models affect eating by providing a norm of appropriate intake, but whether a norm is followed depends upon whether it is perceived as relevant. When a model ate a small versus a large amount, participants reported that a smaller amount of food was appropriate to eat in that situation and this perception accounted for the smaller portion eaten by the participants in the presence of the model who ate sparingly [17\*\*]. When participants saw themselves as belonging to the same social group as the model, and strongly identified with the group, modelling was enhanced [18,19]. Complex social comparison processes underlie decisions about whether a norm is relevant [20\*\*]. We know relatively little about how people make these judgements but it seems that physical similarity between the model and participant is not a prerequisite for modelling [21]. Whether we choose to follow the lead of a relevant model also depends upon the level of uncertainty we experience about what is 'normal' in that situation [22] and how much importance we place on 'fitting in' [23,24], which may be related to personality traits such as self-esteem and empathy. If we have a strong habitual or personal norm and are not terribly concerned about how others see us then we may be resistant to modelling effects [25].

### Mediators of social influence on eating

How people adjust their own eating to fit in with perceived norms has received recent attention. In a situation where the behaviour of another person communicates the norm, we may track their consumption and adjust our own intake accordingly [17\*\*]. Other evidence points to behavioural mimicry processes that facilitate modelling [26–29]. In some studies, participants report being unaware of social influence despite evidence to the contrary [30,31], whereas others have found that participants report social influence accurately. It may be that modelling involves both monitoring of intake and behavioural synchrony (if another person is present), both of which may be open to verbal report depending on how awareness of social influence is assessed [32]. An interesting question that has yet to be addressed whether acknowledging social influence affects how we eat. Does being aware that we eat more in groups reduce our susceptibility to social facilitation of eating? Are we less likely to experience self-blame when we eat more than we would have liked if we attribute social influence?

Another way in which we might bring our eating in line with that of others is via changes in food liking and preferences [6]. Conforming to a group norm is a rewarding experience [33] and eating with someone else

amplifies the hedonic aspects of the experience [34\*]. Furthermore, positive social feedback from peers increases expected liking and positive attitudes towards a food [19,35] as well as the internal valuation of that food [36\*\*]. These data suggest that we eat like other people because we find it a positive emotional experience and we use norms to inform our own food preferences.

### Field studies

Social influence of eating is not restricted to 'artificial' laboratory situations [37]. The number of chocolates taken by visitors to a work lunchroom was higher when the norm (empty chocolate wrappers in a bowl) indicated that other people had eaten the chocolates, than when there was no visible evidence of consumption [10]. Placing a poster indicating the popularity of a product with others increased purchases of that product when participants had engaged in a task designed to deplete self-control resources [38], although the slogan may have increased purchases by increasing perceived scarcity of the item [39]. When observed in a fast food restaurant, women ate less in mixed sex groups than when with other women and men ate more in mixed groups than when in mixed pairs [40], which is consistent with reports that women tend to eat less in the presence of a desirable partner they wish to impress and that men may eat large portions to assert their masculinity [5,41]. Women did not match the intake of men possibly because they were following the stereotypical norm that women eat lightly rather than the competing situational norm of high intake set by the men. Which norm is followed when there are competing norms is a question that deserves further investigation.

### Links between social norms and diet and obesity

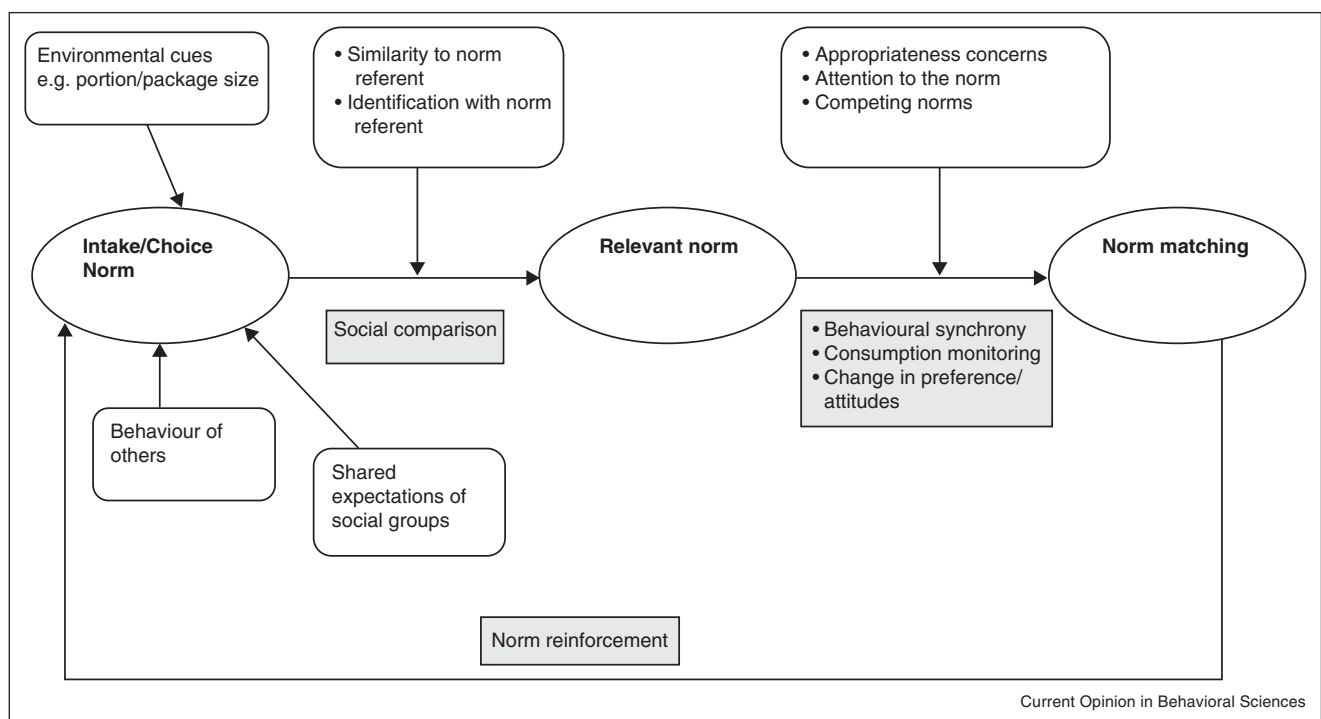
The diets of socially connected individuals are correlated [15,42–47], although the relatively modest associations observed in some studies [48] may be because diet similarity among friends and family is most likely when concerns with behaving 'correctly' are high [49]. Sophisticated social network analyses have been applied to try and tease out the influence of social norms from the effects of shared genetics and/or environment or homophily (similar individuals being more likely to develop social relations) in dietary resemblance. This is a difficult enterprise, in part because people may behave in a certain way to make social connections and then that behaviour might be reinforced once the relationship is established suggesting multiple dynamics at play [50]. People's eating choices appear to be influenced by the eating choices of those to whom they are socially connected [51–53] but future studies might address current methodological limitations by adopting an experimental approach to network analysis and improving methods of dietary intake analysis [54].

The adoption of normative eating patterns that promote overeating, without later compensation for the additional intake, could explain clustering of obesity in social networks [55–57], although changes in physical activity norms and/or perceptions about acceptable body sizes might also explain social patterning of obesity [58]. Social norms may have had a role to play in recent rises in obesity by reinforcing new behaviour patterns associated with overeating and weight gain. For example, increases in average portion size may have created new consumption norms that are diffused through social networks [59]. It might also be that the social context of eating has changed recently in ways that favour overconsumption. For example, more people eating away from home in fast food restaurants with others might be associated with social facilitation of eating. Maybe inhibitory eating norms, such as the norm of not eating more than others, have been relaxed, resulting in greater responsiveness to environmental cues that promote eating [17\*\*]. Research into the precise mechanisms that underlie social transmission of eating patterns in social groups and the contribution of social eating norms to recent rises in obesity is in its infancy but deserves further investigation.

### Harnessing social norms to promote healthier eating and weight loss

The idea that social norms may be used to promote healthy behaviours is gaining traction [60], and there is evidence that social norms for healthy behaviours can aid healthy eating and weight loss attempts [61,62\*,63]. Several studies (mostly lab based) have examined the effectiveness of norm based messages in promoting healthier eating intentions and behaviour. The results so far have been mixed with five studies showing positive effects [18,38,64,65\*,66] but two reporting null effects [67,68], and so confirmation of the effectiveness or otherwise of social norm interventions on diet awaits the results of randomised clinical trials in the field. A practical issue that also needs addressing is whether social norm interventions can be devised to promote eating behaviours that are actually not the norm. If healthy eating patterns are not the norm in a population then interventions might be based on, firstly, the prevalence of healthy eating intentions, rather than actual behaviour; secondly, absolute numbers of people eating healthily to create a perception of normative behaviour; thirdly, targeting individuals with particularly unhealthy diets who believe that this

Figure 1



A model of normative eating behaviour. Norms of appropriate eating are set by the behaviour of other people, shared cultural expectations, as well as environmental cues such as portion size that imply socially normative consumption. People engage in social comparison to the norm referent to decide if the apparent norm is relevant to them, taking into account their similarity to and strength of identification with the norm referent. If a norm is relevant then there may be matching of behaviour to the norm but this will depend on other temperamental and contextual factors such as the attention paid to the norm, concerns about behaving in a socially appropriate manner and other competing norms such as personal norms (habitual intakes) and stereotypes (e.g. the norm that women eat 'lightly'). The process of behavioural adjustment may involve processes such as synchronisation of eating actions, consumption monitoring and changes in evaluation of the food. Matching to the norm will reinforce the norm.

is the norm; or lastly, the behaviour of influential role models.

## Conclusions

Judging by the number of studies published on social influence on eating in the last two years, it is thriving research area. A picture is emerging of how norms of appropriate intake influence our own eating and the factors that moderate these processes (see Figure 1). Evidence is accumulating that social influences on eating are powerful and pervasive and that the social context of eating may be an important factor underlying the development and maintenance of obesity. Emphasising the healthy eating intentions and behaviours of others may be beneficial in bringing about dietary change.

## Funding

This work and the work cited herein was supported by a grant from the Economic and Social Research Council, UK (ES/K002678/1). The funder had no role in: the study design; the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

## Conflict of interest

None declared.

## References

- Oh A, Erinosho T, Dunton G, Perna M, Berrigan FD: **Cross-sectional examination of physical and social contexts of episodes of eating and drinking in a national sample of US adults.** *Public Health Nutr* 2014, **17**:2721-2729.
- Herman CP, Roth DA, Polivy J: **Effects of the presence of others on food intake: a normative interpretation.** *Psychol Bull* 2003, **129**:873-886.
- Cruwys T, Bevelander KE, Hermans RC: **Social modeling of eating: a review of when and why social influence affects food intake and choice.** *Appetite* 2015, **86**:3-18.
- Herman CP: **The social facilitation of eating. A review.** *Appetite* 2015, **86**:61-73.
- Vartanian LR: **Impression management and food intake. Current directions in research.** *Appetite* 2015, **86**:74-80.
- Higgs S: **Social norms and their influence on eating behaviours.** *Appetite* 2015, **86**:38-44.
- Vartanian LR, Spanos S, Herman CP, Polivy J: **Modeling of food intake: a meta-analytic review.** *Soc Inllu* 2015, **10**:119-136. A meta-analysis of research on modelling of food intake. The analysis revealed a large modelling effect across thirty-eight studies such that participants ate more when their companion ate more, and ate less when their companion ate less. The authors conclude that modelling is a robust and powerful influence on food intake.
- Cavazza N, Graziani AR, Guidetti M: **Looking for the "right" amount to eat at the restaurant: social influence effects when ordering.** *Soc Inllu* 2011, **6**:274-290.
- Kaisari P, Higgs S: **Social modelling of food intake. The role of familiarity of the dining partners and food type.** *Appetite* 2015, **86**:19-24.
- Prinsen S, de Ridder DT, de Vet E: **Eating by example. Effects of environmental cues on dietary decisions.** *Appetite* 2013, **70**:1-5.
- Larsen JK, Hermans RC, Sleddens EF, Engels RC, Fisher JO, Kremers SS: **How parental dietary behavior and food parenting practices affect children's dietary behavior. Interacting sources of influence?** *Appetite* 2015, **89**:246-257.
- Houldcroft L, Haycraft E, Farrow C: **Peer and friend influences on children's eating.** *Soc Dev* 2014, **23**:19-40.
- Hermans RC, Larsen JK, Lochbuehler K, Nederkoorn C, Herman CP, Engels RC: **The power of social influence over food intake: examining the effects of attentional bias and impulsivity.** *Br J Nutr* 2013, **109**:572-580.
- Salmon SJ, Fennis BM, de Ridder DT, Adriaanse MA, de Vet E: **Health on impulse. When low self-control promotes healthy food choices.** *Health Psychol* 2014, **33**:103.
- Robinson E, Otten R, Hermans RC: **Descriptive peer norms, self-control and dietary behaviour in young adults.** *Psychol Health* 2015:1-12. (E-pub ahead-of-print).
- Florack A, Palcu J, Friese M: **The moderating role of regulatory focus on the social modeling of food intake.** *Appetite* 2013, **69**:114-122.
- Vartanian LR, Sokol N, Herman CP, Polivy J: **Social models provide a norm of appropriate food intake.** *PLOS ONE* 2013, **8**:e7926 <http://dx.doi.org/10.1371/journal.pone.0079268>. This study is the first direct test of the proposition that social models affect eating behaviour by providing a norm of appropriate food intake. Across three modelling studies, Vartanian and colleagues found that what the model ate affected perceived norms of appropriate intake. These norms mediated the effect of the model on consumption. Hence, when the model ate a small versus large amount, participants reported that a smaller amount of food was appropriate to eat in that situation and this perception accounted for the smaller portion eaten by the participants in the presence of the model who ate very little. Thus, the data suggest that modelling involves the perception of an appropriateness norm.
- Stok FM, Ridder DT, Vet E, Wit JB: **Don't tell me what I should do, but what others do: The influence of descriptive and injunctive peer norms on fruit consumption in adolescents.** *Br J Health Psychol* 2014, **19**:52-64.
- Stok FM, Verkooijen KT, Ridder DT, Wit JB, Vet E: **How norms work: self-identification, attitude, and self-efficacy mediate the relation between descriptive social norms and vegetable intake.** *Appl Psychol Health Well-Being* 2014, **6**:230-250.
- Polivy J, Pliner P: **"She got more than me". Social comparison and the social context of eating.** *Appetite* 2015, **86**:88-95. This review is important in highlighting the role of social comparison processes in eating. The authors argue that comparing ourselves with others plays a crucial role in determining what and how much we eat and that social comparison processes underlie a range of social influences on eating.
- Robinson E, Sharps M, Price N, Dallas R: **Eating like you are overweight: the effect of overweight models on food intake in a remote confederate study.** *Appetite* 2014, **82**:119-123.
- Leone T, Pliner P, Peter Herman C: **Influence of clear versus ambiguous normative information on food intake.** *Appetite* 2007, **49**:58-65.
- Spanos S, Vartanian LR, Herman CP, Polivy J: **Personality, perceived appropriateness, and acknowledgement of social influences on food intake.** *Pers Individ Diff* 2015, **87**:110-115.
- Bevelander KE, Anschütz DJ, Creemers DH, Kleinjan M, Engels RCME: **The role of explicit and implicit self-esteem in peer modeling of palatable food intake: a study on social media interaction among youngsters.** *PLOS ONE* 2013, **8**:e72481.
- Robinson E, Tobias T, Shaw L, Freeman E, Higgs S: **Social matching of food intake and the need for social acceptance.** *Appetite* 2011, **56**:747-752.
- Hermans RC, Lichtwarck-Aschoff A, Bevelander KE, Herman CP, Larsen JK, Engels RC: **Mimicry of food intake: the dynamic interplay between eating companions.** *PLoS ONE* 2012, **7**:e31027.
- Sharps M, Higgs S, Blissett J, Nouwen A, Chechlacz M, Allen HA, Robinson E: **Examining evidence for behavioural mimicry of**



- parental eating by adolescent females. An observational study.** *Appetite* 2015, **89**:56-61.
28. Bevelander KE, Lichtwarck-Aschoff A, Anschutz DJ, Hermans RC, Engels RC: **Imitation of snack food intake among normal-weight and overweight children.** *Front Psychol* 2013:4.
  29. Huh YE, Vosgerau J, Morewedge CK: **Social defaults: observed choices become choice defaults.** *J Consum Res* 2014, **41**:746-760.
  30. Spanos S, Vartanian LR, Herman CP, Polivy J: **Failure to report social influences on food intake: lack of awareness or motivated denial?** *Health Psychol* 2014, **33**:1487.
  31. Robinson E, Field M: **Awareness of social influence on food intake. An analysis of two experimental studies.** *Appetite* 2015, **85**:165-170.
  32. Newell BR, Shanks DR: **Unconscious influences on decision making: a critical review.** *Behav Brain Sci* 2014, **37**:1-19.
  33. Klucharev V, Hytönen K, Rijpkema M, Smidts A, Fernández G: **Reinforcement learning signal predicts social conformity.** *Neuron* 2009, **61**:140-151.
  34. Boothby EJ, Clark MS, Bargh JA: **Shared experiences are amplified.** *Psychol Sci* 2014, **25**:2209-2216.  
 In this study, the presence of a co-eater resulted in participants rating good-tasting chocolate even better and bad tasting chocolate even worse than when there was no co-eating. The results suggest shared eating experiences are more intense than lone eating.
  35. Robinson E, Higgs S: **Liking Food Less: The Impact of Social Influence on Food Liking Evaluations in Female Students.** 2012.
  36. Nook EC, Zaki J: **Social norms shift behavioral and neural responses to foods.** *J Cognit Neurosci* 2015.  
 These authors used functional magnetic resonance imaging (fMRI) to investigate the neural mechanisms underlying the effects of social norms on food preferences. Participants rated their desire to eat a range of foods depicted in images displayed in the scanner and after each trial, were given feedback in the form of peer ratings of the foods. When the food pictures were re-rated by participants their preferences had shifted to conform to the group norms. Initial agreement with the peer ratings was associated with enhanced activity in the nucleus accumbens, which suggests that conforming to group norms is associated with increased reward-related neural processes. Activity in the ventral-medial prefrontal cortex (vmPFC) tracked the popularity of foods. For example, the vmPFC was more active when participants increased their rating to match a higher peer norm. These data are consistent with the suggestion that norm following is associated with altered processing of the reward value of foods.
  37. Mollen S, Rimal RN, Ruiters RA, Kok G: **Healthy and unhealthy social norms and food selection. Findings from a field-experiment.** *Appetite* 2013, **65**:83-89.
  38. Salmon SJ, De Vet E, Adriaanse MA, Fennis BM, Veltkamp M, De Ridder DT: **Social proof in the supermarket: promoting healthy choices under low self-control conditions.** *Food Qual Prefer* 2015, **45**:113-120.
  39. Gierl H, Huettl V: **Are scarce products always more attractive? The interaction of different types of scarcity signals with products' suitability for conspicuous consumption.** *Int J Res Mark* 2010, **27**:225-235.
  40. Brindal E, Wilson C, Mohr P, Wittert G: **Eating in groups: do multiple social influences affect intake in a fast-food restaurant?** *J Health Psychol* 2015, **20**:483-489.  
 In this study, researchers observed diners in a fast food restaurant and found that the amounts of food eaten varied according to the number of diners present and the gender composition of the groups. Female diners ate less when eating in mixed-sex versus same-sex groups, while male diners eating in mixed-sex company ate more when eating in a group than when eating in pairs. The results emphasize that in ecologically valid settings, multiple social influences are likely to affect food intake
  41. Cavazza N, Guidetti M, Butera F: **Ingredients of gender-based stereotypes about food. Indirect influence of food type, portion size and presentation on gendered intentions to eat.** *Appetite* 2015, **91**:266-272.
  42. Guidetti M, Cavazza N, Graziani AR: **Healthy at home, unhealthy outside: food groups associated with family and friends and the potential impact on attitude and consumption.** *J Soc Clin Psychol* 2014, **33**:343.
  43. Pedersen S, Grønhøj A, Thøgersen J: **Following family or friends. Social norms in adolescent healthy eating.** *Appetite* 2015, **86**:54-60.
  44. Pelletier JE, Graham DJ, Laska MN: **Social norms and dietary behaviors among young adults.** *Am J Health Behav* 2014, **38**:144-152.
  45. Stok FM, de Vet E, de Wit JB, Luszczynska A, Safron M, de Ridder DT: **The proof is in the eating: subjective peer norms are associated with adolescents' eating behaviour.** *Public Health Nutr* 2015, **18**:1044-1051.
  46. Tate EB, Unger JB, Chou CP, Spruijt-Metz D, Pentz MA, Riggs NR: **Children's executive function and high-calorie. Low-nutrient food intake mediating effects of child-perceived adult fast food intake.** *Health Educ Behav* 2015, **42**:163-170.
  47. Zarychta K, Mullan B, Luszczynska A: **It doesn't matter what they say, it matters how they behave: parental influences and changes in body mass among overweight and obese adolescents.** *Appetite* 2016, **96**:47-55.
  48. Rozin P, Fallon A, Mandell R: **Family resemblance in attitudes to foods.** *Dev Psychol* 1984, **20**:309-314.
  49. Guidetti M, Cavazza N, Conner M: **Social influence processes on adolescents' food likes and consumption: the role of parental authoritative and individual self-monitoring.** *J Appl Soc Psychol* 2015.  
 In this study, the authors examined similarity between the diet of a target participant and their parent and best friend, while controlling for any effects due to cultural similarities. The correlation between adolescents' food likes and consumption and those of their parents and friends was on average low but the authors showed that the similarity between the adolescent and parent was more pronounced when the adolescent perceived their parents as responsive. The similarity between the adolescent and their best friend in terms of diet was also stronger when the target adolescent was more sensitive to social norms. These data are important in identifying two factors that account for variation in child-parent and friends dietary resemblance.
  50. Hall KD, Hammond RA, Rahmandad H: **Dynamic interplay among homeostatic, hedonic, and cognitive feedback circuits regulating body weight.** *Am J Public Health* 2014, **104**:1169-1175.
  51. Barclay KJ, Edling C, Rydgren J: **Peer clustering of exercise and eating behaviours among young adults in Sweden: a cross-sectional study of egocentric network data.** *BMC Public Health* 2013, **13**:784.
  52. Haye K, Robins G, Mohr P, Wilson C: **Adolescents' intake of junk food: processes and mechanisms driving consumption similarities among friends.** *J Res Adolesc* 2013, **23**:524-536.  
 This is a longitudinal social network study of friendships and self-reported eating behaviour of Australian school children. The authors found that adolescent intake of low nutrient high energy dense foods was predicted by their friends' intake. In particular, over the course of the school year, adolescents' intake became or remained similar to the intake of their best friends. These effects remained significant controlling for potentially confounding factors such as the shared school environment and weight status. These data are consistent with the idea that social ties influence overall dietary selection.
  53. Pachucki MA, Jacques PF, Christakis NA: **Social network concordance in food choice among spouses, friends, and siblings.** *Am J Public Health* 2011, **101**:2170-2177.
  54. Centola D: **The spread of behavior in an online social network experiment.** *Science* 2010, **329**:1194-1197.
  55. Brown H, Hole AR, Roberts J: **Going the same 'weigh': spousal correlations in obesity in the United Kingdom.** *Appl Econ* 2014, **46**:153-166.
  56. Christakis NA, Fowler JH: **The spread of obesity in a large social network over 32 years.** *N Engl J Med* 2007, **357**:370-379.
  57. Quist HG, Christensen U, Carneiro IG, Hansen JV, Bjorner JB: **Do colleagues influence our lifestyle: the matter of smoking, body mass index and leisure-time physical activity?** *Prev Med* 2014, **67**:166-170.
  58. Pachucki MC, Goodman E: **Social relationships and obesity: benefits of incorporating a lifecourse perspective.** *Curr Obes Rep* 2015, **4**:217-223.

## 6 Diet, behavior and brain function

59. Herman CP, Polivy J, Pliner P, Vartanian LR: **Mechanisms underlying the portion-size effect.** *Physiol Behav* 2015, **144**:129-136.
60. Robinson E, Blissett J, Higgs S: **Social influences on eating: implications for nutritional interventions.** *Nutr Res Rev* 2013, **26**:166-176.
61. Leahey TM, LaRose JG, Fava JL, Wing RR: **Social influences are associated with BMI and weight loss intentions in young adults.** *Obesity* 2011, **19**:1157-1162.
62. Jackson SE, Steptoe A, Wardle J: **The influence of partner's behavior on health behavior change: the English longitudinal study of ageing.** *JAMA Intern Med* 2015, **175**:385-392.

This study examined prospective data from married and cohabiting couples who were part of a large population based cohort of older adults. The authors report that for participants who were overweight, having a partner whose BMI was consistently in the normal range did not increase the odds of losing weight, but having an overweight partner who lost weight was associated with 3 times higher odds of weight loss. The results suggest that involving partners in weight loss interventions may help improve outcomes.
63. Shin HS, Valente TW, Riggs NR, Huh J, Spruijt-Metz D, Chou CP, Ann Pentz M: **The interaction of social networks and child obesity prevention program effects: the pathways trial.** *Obesity* 2014, **22**:1520-1526.
64. Robinson E, Harris E, Thomas J, Aveyard P, Higgs S: **Reducing high calorie snack food in young adults: a role for social norms and health based messages.** *Int J Behav Nutr Phys Activ* 2013, **10**:73.
65. Robinson E, Fleming A, Higgs S: **Prompting healthier eating: testing the use of health and social norm based messages.** *Health Psychol* 2014, **33**:1057.

These are the first laboratory based studies to show that exposure to a message emphasising the healthy eating habits of other students increases actual intake of fruit and vegetables when compared with exposure to a message emphasising the health benefits of eating fruit and vegetables. The effects were only seen in those participants who were low habitual consumers of vegetables suggesting that interventions based on social norm messages may be effective in targeting the eating habits of those who would most benefit from dietary improvement.
66. Tarrant M, Khan SS, Qin Q: **Effects of norm referent salience on young people's dietary orientation.** *Appetite* 2015, **85**:160-164.
67. de Bruijn GJ, Visscher I, Mollen S: **Effects of previous fruit intake, descriptive majority norms, and message framing on fruit intake intentions and behaviors in Dutch adults across a 1-week period.** *J Nutr Educ Behav* 2015, **47**:234-241.
68. Verkooijen KT, Stok FM, Mollen S: **The power of regression to the mean: a social norm study revisited.** *Eur J Soc Psychol* 2015.