



EJM
47,9

1458

Received 7 October 2011
Revised 29 March 2012
31 August 2012
23 October 2012
20 November 2012
Accepted 29 November 2012

Is social norms marketing effective?

A case study in domestic electricity consumption

Tim Harries and Ruth Rettie

*Behaviour and Practice Research Group, Marketing Department,
Kingston University London, Kingston-upon-Thames, UK*

Matthew Studley

*Department of Engineering, Design and Mathematics,
University of the West of England, Bristol, UK*

Kevin Burchell

*Behaviour and Practice Research Group, Marketing Department,
Kingston University London, Kingston-upon-Thames, UK, and*

Simon Chambers

*Department of Engineering, Design and Mathematics,
University of the West of England, Bristol, UK*

Abstract

Purpose – The purpose of this paper is to present details of a large-scale experiment that evaluated the impact of communicating two types of feedback to householders regarding their domestic electricity consumption: feedback on their own consumption and feedback of both their own consumption and that of others in their locality.

Design/methodology/approach – Digital technologies were used to automatically measure and communicate the electricity consumption of 316 UK residents for a period of 16 weeks. Participants were randomly assigned to one of three experimental conditions: one involving no feedback; one involving feedback about a household's own usage, and one involving a household's own usage plus social norms feedback (the average consumption of others in the locality). At the end of the study, a selection of participants took part in interviews or focus groups.

Findings – Both types of feedback (individual and individual-plus-social-norms) led to reductions in consumption of about 3 per cent. Those receiving social norms feedback were significantly more likely to engage with the information provided. However, the social norms information had no additional impact on consumption. Survey and interview data confirmed that participants from both conditions had been encouraged to adopt new energy-saving practices. The study concludes that near real-time individual feedback can be sufficient for usage reduction if it is provided in a historical format. It also suggests that the impact of social norms information may previously have been confounded with that of individual feedback.

Originality/value – This is the first time that a controlled experiment in the field of domestic electricity consumption has compared the impact of real-time social norm information with that of information that only contains individual household usage.

Keywords Social norms approach, Green marketing, Sustainability, Behaviour change, Electricity consumption, Social marketing, Digital marketing, United Kingdom

Paper type Research paper



Introduction

Ever since the foundational work of social psychologists Asch (1987) and Milgram (1974) there has been a great deal of interest in the influence on behaviour of perceptions of “normal”. In social marketing, this has led to the development of the social norms approach (Cialdini and Goldstein, 2004), a marketing technique that attempts to influence behaviour by changing perceptions of what is normal (Lewis and Neighbors, 2006; Neighbors *et al.*, 2010; Burchell *et al.*, n.d., forthcoming). According to the literature, this approach has proven successful in influencing bullying (Perkins *et al.*, 2009), substance abuse among students (Perkins, 2003; Bosari and Carey, 2003; Berkowitz, 2005; McAlaney and McMahon, 2007; Neighbors *et al.*, 2008; Moreira *et al.*, 2009), household recycling (Schultz, 1999; Nomura *et al.*, 2011), hotel towel re-use (Goldstein *et al.*, 2008), the payment of tax debts (Cabinet Office, 2012) and domestic electricity consumption (Allcott, 2011; Ayres *et al.*, 2009).

Funded by the Research Council UK Digital Economy Programme, and part of the suite of research projects known collectively as *CHARM*, this study set out to question the validity of these case studies and to assess the value of the social norms approach as a tool in the armoury of the social marketing practitioner. The field of domestic electricity was selected because the impact of social norms information is contested in this area and because the reduction of domestic consumption is an important social policy goal. The research aimed to ascertain whether social norms add significantly to the persuasive power of social marketing messages and to consider whether previous research on electricity consumption confounded the effects of the approach with those of feedback that only includes information on a household’s own consumption.

The reduction of electricity consumption for the mitigation of climate change has a central place in policy discourse (Defra, 2006; DECC, 2010; HM Government, 2009) and has become a key social marketing objective (Hargreaves, 2011; Collier *et al.*, 2010; Whitmarsh and Seyfang, 2011). The 2008 Climate Act committed the UK to reduce its 2050 carbon emissions to 80 per cent of 1990 levels. Domestic consumption constitutes 31 per cent of the UK’s electricity demand (DECC, 2011). However, driven in part by the growth in consumer electronics and domestic appliances, it increased by 0.1 per cent in 2010 (Firth *et al.*, 2008) and is not currently expected to fall sufficiently for the UK to achieve this target (Chitnis and Hunt, 2012). The use of the social norms approach on this issue is currently endorsed by the UK Government (Cabinet Office, 2011) and has already been adopted by the UK electricity provider First Utility (Solon, 2011).

Theoretical background and hypotheses

In applying the social norms approach to electricity consumption, it is important to consider how electricity differs from other types of consumer product. Electricity is abstract, invisible, intangible and only consumed indirectly and as a by-product of other practices (Fischer, 2008). Furthermore, there is no clear link to cost or the level of spend relative to the norm; indeed, electricity consumption has been compared to shopping in a store where none of the products have price labels and the customer only receives a quarterly bill (Kempton and Layne, 1994). Finally, because the invisibility of electricity inhibits emotional attachments between customer and product, consumption patterns are rarely perceived as lifestyle statements (Birzle-Harder and Götz, 2001).

Feedback about consumption can address some of these differences and expose electricity consumption to the same norm-transforming influences experienced by

other products. Established behavioural norms are challenged when there is increased awareness, motivation to change, realisation that a person's behaviour can have an impact and a belief that it is within a person's power to change that behaviour (Fischer, 2008). By facilitating progress through these stages, feedback about levels and patterns of consumption can lead to reductions of 5-15 per cent (Fischer, 2008; Darby, 2006). It does this by increasing householders' awareness of the amount of electricity they consume, alerting them to undesirable aspects of that consumption (such as waste or cost) and highlighting particular areas of consumption that, if changed, would reduce the undesirable elements of the overall outcome. Hypothesis *H1* is designed to test whether feedback does, indeed, reduce electricity consumption:

H1. Changes in electricity consumption during the study will be positively related to the receipt of feedback on electricity consumption.

The social norms approach contends that the impact of feedback will be greater if it includes information about what is normal behaviour because such information can simplify or bypass decision-making by acting as a heuristic short-cut or "nudge" (see Thaler and Sunstein, 2008). The approach provides individuals with information about the average behaviours of a group of salient others and assumes that the inclination to conformity will encourage them to try to emulate that norm.

In social norms marketing campaigns, these descriptive norms are sometimes combined with a second kind of norm more familiar to social marketers: the injunctive norm. Whereas descriptive norms describe what most people actually do, injunctive norms communicate what they ought to do. Although known by a variety of names, injunctive norms occur in many behaviour change models, including the norm-activation model and the theory of planned behaviour (Bamberg and Möser, 2007; White *et al.*, 2009; Carus *et al.*, 2008). Like proponents of social norms theory, supporters of these models now argue that injunctive norms are an essential theoretical and practical complement to descriptive norms (Fishbein and Yzer, 2003), which by themselves have insufficient predictive power (Armitage and Connor, 2001).

However, not all commentators consider social norms an essential element of feedback. Fischer (2008) argues that effective feedback on electricity consumption must be frequent, appliance-specific, and long-term, include historic comparisons and be understandable and engaging. Conspicuous by their absence from this list are normative comparisons. Of the 12 studies in her meta-analysis that included normative comparisons, Fischer reports that none showed any evidence that normative information affected consumption. Similarly, Darby (2006) concluded that normative feedback was less effective than feedback relating to a household's own consumption. These conclusions are difficult to verify. Although Fischer claims that she reviewed 12 studies that used normative feedback, only three of these can be identified from her paper and of these, one (Garay and Lindholm, 1995) did not analyse the impacts of feedback on consumption and one relied on self-reported consumption change, which is not reliable. A study by Dünnhoff and Dusche (2008) reported a reduction of 8 per cent in actual consumption, but this was the result of a range of measures, not only usage feedback. Similarly, of the two studies identified by Darby (2006) as employing comparative feedback, one was the paper by Garay and Lindholm (1995), mentioned previously, and the other (Brandon and Lewis, 1999) had a sample of just 16.

In sharp contrast to Darby and Fischer, the authors of four US studies report the social norms approach to be effective in reducing domestic electricity consumption. The first of these (Schultz *et al.*, 2007) can be dismissed, for although social norms were used, the primary aim was not to test their impact on consumption and no control group was involved. The second, Nolan *et al.* (2008), found that after one month social norms messages ($N = 46$) had reduced consumption by 11 per cent more than the other types of feedback and after two months by 7 per cent more. Most recently, two studies looked at the impact of a programme implemented by Opower, a US company that partners with utility companies to help them promote energy efficiency. This programme posts reports containing social norms with households' bimonthly/quarterly electricity bills. With samples of 85,000 (Ayres *et al.*, 2009) and 600,000 (Allcott, 2011) and intervention periods of one year and two years, respectively, these evaluations identified reductions of 2-2.35 per cent. However, they failed to distinguish the impact of social norms feedback from that of feedback of a household's own consumption for social norms feedback was presented to participants alongside their own household's data.

This study aimed to ascertain whether the use of social norms data adds significantly to the impact of consumption feedback. To avoid the mistake made by the US studies, a second control condition was included in which participants received feedback on their own consumption but not on the consumption of others. *H2* is designed, therefore, to test the additional impact of social norms feedback:

- H2.* Participants that receive feedback on both their own consumption and that of others will reduce their electricity usage more than those that receive feedback on their own consumption only.

Finally, prompted by a suggestion in the interview data that social norms information made the feedback more engaging for participants, it was hypothesised that social norms information might encourage participants to read feedback more assiduously. Mass marketing normally only gains the attention of small percentages of its intended audience. (In the UK only 18.35 per cent of recipients open marketing e-mails sent by SMEs and only 31.17 per cent open those sent by government – McNeill, 2012). We tested the impact of social norms data on engagement levels with the following hypothesis:

- H3.* Among those participants that receive feedback, frequency of engagement with the feedback will be positively related to receipt of social norms feedback.

Methods

Consumption data were collected from participants using purpose-built monitoring devices capable of measuring consumption changes of 1 Watt or more, which sent hourly-usage data to the study server via a mobile telephony service. Participants were randomly allocated to either a condition in which they were given no feedback on their electricity consumption (the control condition), a condition in which they received feedback on their own household's consumption (the individual condition) or a condition in which feedback also included the consumption levels of other households in their locality (the social norms condition). After a two-week baseline period during which no participants received any feedback, measurement and feedback occurred for

a period of 16 weeks. During this time, data were collected on the number of times participants downloaded their feedback graphs. Furthermore, to allow for the control of factors such as household structure, the study used pre- and post-experiment participant questionnaires to collect data on demographics and the response to the interventions. An example of partially-mixed research (Leech and Onwuegbuzie, 2009), the study also included in-depth interviews and focus groups, which were used to explore the reasons for participants' responses to the feedback.

The experiment

Consumption data were provided to those in the two feedback conditions in the form of bar graphs depicting different views of electricity consumption. Four types of graph were made available to participants: the current day's usage; the previous day's usage; the previous seven days' usage, and daily usage since the start of the study. For those in the social norms condition (see Figure 1), these also included information on average electricity consumption levels of other households in the locality (the higher of the two lines; originally in red) and the consumption of the lowest consuming 20 per cent (the lower line; originally in orange). Graphs provided for the social norms condition also included statements reflecting the relative level of consumption (see the Appendix, Table AI).

Participants were able to access all four types of graph at any time during the study on personalised password-protected web sites and were sent weekly marketing e-mails containing one recent graph. The web sites and e-mails also contained generic tips on household energy saving. Fortnightly mobile phone text messages reminded participants to read their e-mails and access their web pages.

Measures

The first of two key measures in the analysis was the proportional change in consumption between the two-week baseline period and the period spanning week 8 of the study and the close of the study in week 17. Week 8 was chosen for the start of the comparison period because the process of participating in a trial can itself cause participants to change their behaviour and any resulting behaviour change among the control group might have obscured the impact of the feedback.

Electricity Consumption

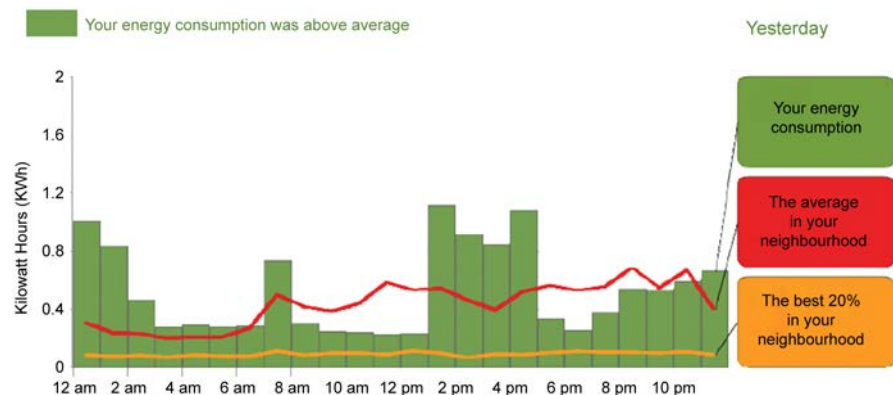


Figure 1.
Example of a graph sent to a participant in the social norms condition

The second key measure was the number of times participants downloaded the feedback graphs, which was a proxy for the number of times they engaged with the feedback. Downloads were recorded automatically, with the running total increasing each time an e-mail was opened or a graph was viewed on the Internet. If participants forwarded e-mails to family members, opened the same e-mail repeatedly or viewed the same web-graph more than, the count would be increased accordingly. As this variable was not normally distributed ($k = 4.12$), a logistic transformation was applied prior to analysis.

To make it possible to control for the impact of demographics, the pre-study survey collected participant data on a range of variables considered most likely to be significant; namely, number of adults and children in the household and household income. Data on respondent age, gender and social class was also collected.

In addition to the quantitative data collection, 22 depth-interviews and two focus groups were conducted to illuminate responses to the feedback and perceptions of impact on energy consumption. These involved a total of 33 participants, five of who were interviewed at both the start and end of the study.

Sampling and recruitment

Following a pilot ($N = 10$), participants for the experiment were recruited door-to-door in two residential areas of Bristol, UK, by a professional marketing fieldwork company. Recruitment criteria included home access to the Internet and weekly use of e-mail. Furthermore, blocks of flats were excluded from the study because of technical issues relating to electricity-monitoring and transmission technology, and shared student accommodation and homes with electric heating were excluded to ensure sample homogeneity. The demographic makeup of the 316 participants that provided electricity data for the full 18 weeks of the study is shown in Table I.

The 17 interview participants were chosen to ensure a balanced distribution across the characteristics considered most likely to influence the impacts of the interventions

	(%)
<i>Gender</i>	
Female	59
Male	41
<i>Social class</i>	
ABC1	68
C2DE	32
<i>Age</i>	
16-34	18
35-54	46
55-65	22
65 +	14
<i>Household structure</i>	
Adults and kids	46
Single adult	8
Adults no kids	46

Table I.
Demographic
characteristics of the
experiment sample (%)

– i.e. overall level of electricity consumption, social class and household structure. As the main aim was to understand and compare the influence of individual and social norms feedback, most were recruited from the social norms condition ($N = 13$), only one from the control condition and three from the individual condition. The 16 participants for the two focus groups were recruited at random from those in the social norms condition.

Analysis

To combine the strengths of ANOVA with the ability to easily control for more than one independent variable, the analytical method of multiple linear regression was adopted (Field, 2005). Although it had been intended to include income as an independent variable, 24 per cent of the sample had refused to provide income data and as an initial set of analyses showed no correlation with consumption change, the income variable was omitted from the analyses. Collinearity levels were assumed to be within acceptable levels if they did not lead to over-inflation of the standard error (i.e. average VIF close to 1.00) and the tolerance of each variable was greater than 0.2 (see Field, 2005).

Qualitative analysis was conducted using the data management and coding package, *Atlas.ti*. Initially a coding framework was derived from the key themes identified in the literature and by the interviewer. Subsequently, a small number of transcripts were independently coded by two of the research team, who then compared their analyses, refined the coding frame and added new codes that had emerged. This final coding frame was applied to the remaining transcripts.

Findings

Impact of the feedback on changes in electricity consumption (H1)

Compared to the control group ($SD = 0.19$; $N = 121$), the reduction in consumption was 3 per cent greater for both the social norms group ($SD = 0.20$; $N = 122$) and the individual group ($SD = 0.23$; $N = 124$). However, as shown in Table II, neither of the effects associated with the feedback conditions were statistically significant ($p > 0.1$ for both social norms condition and individual condition). *H1* was therefore not supported. The data also shows that household structure had no effect on the impact of feedback ($p > 0.1$ for single person household and children in household).

Independent variables (comparison groups shown in brackets)	<i>n</i>	Std. error	Beta	<i>p</i>	95% C.I. for B	
					Lower	Upper
Social norms condition (Individual/control condition)	107 217	0.03	-0.05	0.44	-0.08	0.03
Individual condition (Social norms/control condition)	107 217	0.03	-0.08	0.22	-0.09	0.02
Single person household (No)	28 296	0.04	0.08	0.20	-0.03	0.14
Children in household (No)	146 178	0.02	-0.09	0.14	-0.08	0.01
Constant		0.02		0.00	0.79	0.88

Table II. Regression analysis of experimental condition on changes in consumption

Impact of the inclusion in the feedback of social norms data (H2)

Table III confirms that household structure had no effect on the impact of feedback ($p > 0.1$ for single person household and children in household) and shows that there was no significant difference between the impact on consumption of the individual feedback condition and the social norms condition ($p > 0.1$ for social norms condition). In fact, average change in consumption for the former (21.73 per cent) was slightly higher than for the latter (20.93 per cent). *H2* was therefore not supported.

Impact of social norms data on engagement with the feedback (H3)

Table IV shows that the number of e-mail downloads was related to the type of feedback ($p < 0.05$). Those in the social norms condition downloaded e-mailed graphs 19.8 times, while those in the individual condition only downloaded them 13.4 times (OR = 1.48). Web viewings, however, were not related to feedback type ($p = 0.89$; analysis not shown). *H3* is therefore proven for e-mailed feedback but not for web-based feedback. The number of adults in a household had no impact on the downloading of e-mailed graphs ($p = 0.96$) or web graphs ($p = 0.67$), but households with children downloaded less graphs from both sources (e-mailed graphs: $p < 0.1$, Beta = -0.14 ; web downloads: $p < 0.1$, Beta = -0.13).

Given that only 18 feedback e-mails were sent during the study, the 19.8 downloads by the average social norms participant is exceptionally high[1]. Typically only 18.35 per cent of UK recipients open marketing e-mails sent by SMEs and only 31.17 per cent open those sent by government (McNeill, 2012).

Independent variables (comparison groups shown in brackets)	n	Std. error	Beta	p	95% C.I. for B	
					Lower	Upper
Social norms condition	107	0.03	0.04	0.59	-0.04	0.07
(Individual condition)	107					
Single person household	18	0.05	0.10	0.16	-0.03	0.18
(No)	196					
Children in household	103	0.03	-0.11	0.14	-0.10	0.02
(No)	111					
Constant		0.03		0.00	0.75	0.85

Table III.
Regression analysis of
type of feedback onto
change in consumption

Independent variables (comparison groups are shown in brackets)	n	Std. error	Beta	p	95% C.I. for B	
					Lower	Upper
Social norms condition	107	0.15	0.16	0.02	0.05	0.64
(Individual condition)	107					
Single person household	18	0.28	0.00	0.96	0.54	0.56
(No)	196					
Children in household	103	0.15	-0.14	0.06	-0.60	0.01
(No)	111					
Constant		0.13		0.00	2.17	2.69

Table IV.
Linear regression of type
of feedback onto number
of e-mailed graphs
downloaded



Discussion

The objective of this research was to evaluate the impact of feedback on domestic electricity consumption and to determine whether social norms information contributes significantly to the persuasive power of social marketing messages in this domain. In an 18-week experiment ($N = 316$), a control condition received no feedback, a second sample of participants received feedback about their own consumption and a third received information about their own consumption and how it compared to an average for their locality. Statistical analysis assessed whether the feedback caused any changes in consumption (*H1*), whether the social norms feedback caused any additional change in consumption compared to feedback on individual consumption alone (*H2*) and whether the social norms feedback caused additional engagement with the feedback (*H3*). Only the third of these hypotheses was proven.

Energy consumption saw a decline of 3 per cent, relative to the control, in both intervention conditions. However, the significance test for *H1* was weakened by a smaller than anticipated effect and by the size of the standard deviation of the dependent variable. To avoid the rejection of true hypotheses, a statistical test requires statistical power – a function of sample size, effect size and the standard deviation of the dependent variable – to be at least 0.80 (Field, 2005). The sample size for the research had been calculated on the assumption that average reductions in consumption would fall into the 5-15 per cent range identified by Fischer (2008) and Darby (2006). With an effect size of just 3 per cent and a larger than expected standard error (0.21), the power of the test for *H1* was just 0.22 for the social norms condition and 0.27 for the individual condition (see Buchner *et al.*, 2001).

A number of factors might explain the relatively small reduction in consumption produced by the feedback. One is the difference between consumption patterns in the UK and the US. Daily household usage in this study and in the UK as a whole averaged at about 13kWh during the study period, compared to the average in Allcott's (2011) US sample of 31kWh. Furthermore, domestic consumption in the UK is less amenable to behaviour change. In the US, electricity is commonly used as the main source of heating and for air-conditioning, and these are responsible for 25 per cent of US domestic energy consumption (McKenzie-Mohr *et al.*, 2012). In the UK, few domestic properties have air-conditioning and it is unusual to have electric central heating (which is why homes using electricity for their heating were excluded from the study). Space-heating and air-conditioning practices are more easily changed than other high-consuming domestic practices such as cooking and lighting, and relatively small behaviour changes in the former have a larger impact on consumption than similar changes in the latter (see Wilhite, 1997). Hence, the gearing of behaviour-change to electricity-consumption will be lower in the UK and consumption is likely to be less tractable than in the US – especially in the short term. None of the electricity studies reviewed in this study used qualitative research to determine which behaviour changes generated the recorded consumption reductions, but heating and air-conditioning practices are likely to account for the substantial consumption change found in the US studies. In this study, the qualitative interviews and the post-study questionnaire both indicate that changes in standby behaviour and the use of lights were the most common. Standby consumes relatively very little electricity and participant data from the pre-study survey indicated that 53 per cent of light bulbs were already low-energy, so it seems likely that even if the feedback prompted significant behavioural changes, these would not have resulted in substantial consumption reductions.

While the statistical test failed to provide proof of *H1*, the methodological triangulation built into the study provides evidence to suggest that the feedback did cause some reductions in consumption. In the post-study questionnaire, 55 per cent of participants who had received feedback claimed that they had changed the way they “use electricity”, compared to just 19 per cent of the control group ($N = 320$; $df = 4$; $p < 0.005$; $\chi^2 = 44.55$). This was supported by the qualitative interviews, in which participants attributed a range of behaviour changes to the feedback.

Given that consumption levels in the UK are lower and less open to change than in the US, the similarity in size of the effect in this study to those found by Allcott (2011) and Ayres *et al.* (2009) is surprising. High levels of engagement indicate that this was due to the frequency and format of the feedback. The interviews reveal how the granularity of the data enabled participants to identify and target those activities that consumed the most electricity. This was not possible for the participants in the three US studies, who were only given aggregated monthly figures.

A further issue is householders’ perceptions of the relevance of the social norms feedback. The studies by Allcott (2011) and Ayres *et al.* (2009) analysed data from the Opower programme, in which large-scale participation enabled the social norms approach to be based on comparisons between broadly comparable households. In contrast, like Nolan *et al.* (2008), the social norms comparisons used in the present smaller-scale study did not distinguish by house type or occupancy. However, although this may have influenced the results of the study, the following interview extract illustrates that this did not necessarily reduce the effectiveness of the feedback:

Householder: I thought the average was a bit low [...] I mean I know that the majority of the streets round here, you know, haven’t got that many families. They’re either grown up and gone or they’re widows [...] But I have [...] it has made me, I suppose, take note a little bit more for the fact that I switch off all the lights now and you know, I make a point of doing that [...].

Interviewer: If the graphs had just shown the green bars – just your own energy use – would that have been as good? Would that have made a difference to you? If they’d not had the red lines and the orange lines ...?

Householder: No I think what made me [...] the three things – the three lines that was my usage, the average usage and the best usage in the area – it makes you [...] it had to be like that to make you think that you were using perhaps a bit too much or, “hang on a minute”, you need to tell yourself, “oh I know why I’m using it at that time, because the boys need their dinner”. So yeah, you do need the three lines, yeah you do (Male professional; married with two children; social norms condition).

More important than the lack of firm evidence in favour of *H1* is the much clearer failure to find any evidence for *H2*. Although not statistically significant, the indicative change in consumption caused by the addition of social norms data were the opposite effect to that predicted.

One explanation for this might be that the social norms information was of little interest to participants and perhaps even weakened their inclination to reduce consumption. Such an interpretation is supported by Fischer (2008), who argues that the social norms approach is culturally specific and, citing IEA (2005), claims that UK residents are less interested in social norms data than others. However, the qualitative data from the interviews and focus groups belies this conclusion, for it suggests that

participants were, in fact, very interested in the social norms feedback because it allowed them to make relational value judgements about their consumption. As explained by one interviewee, people like to know whether their consumption is “bad” or “good”. Fischer’s contention is also challenged by the confirmation of *H3*, which shows that people were more likely to download (and presumably also, read) e-mails that contained social norms feedback.

A final question concerns why the social norms approach seems to be ineffective in the electricity domain despite evidence of its efficacy in other areas. One possible explanation is that individual-level feedback might have been equally effective in these other areas had it been included as a control. An exhaustive review revealed only two studies that included both a social norms condition and a condition in which only individual-level data were provided: a study by Bewick *et al.* (2008) that allowed students to compare self-reported alcohol consumption with social norms and a study of recycling behaviours by Schultz (1999). However, neither of these two studies reported on the statistical significance of any differences between the two forms of feedback.

A further possible explanation is to be found in what Schultz *et al.* (2007) term the boomerang effect. Although the social norms feedback may have encouraged some participants to consume less, it may also have prompted some of those below the norm to consume more. Schultz *et al.*’s (2007) experiment indicated that this effect could be avoided by giving positive injunctive messages (e.g. smiling face symbols or congratulatory statements) to those who were “better” than the norm. However, Ayres *et al.* (2009) found that the use of such messages failed to eliminate the boomerang effect among the 35,000 participants in their study who received the social norms feedback. Unfortunately, it was not possible to test for this effect in the present research.

A second possible reason for the failure of the social norms approach lies in the distinction made by Van Raaij and Verhallen (1983) between energy use and energy-related behaviour. As argued previously, people do not “use energy”; rather, they engage in behaviours that happen to use electricity. Hence, in both the current study and the three US studies of domestic electricity, the object of measurement and comparison, electricity use, was an indirect outcome of behaviour rather than behaviour itself. In previous research into the social norms approach it was the behaviours themselves that were measured and compared. Goldstein *et al.* (2008) provided feedback on the re-use of hotel towels rather than on the energy consequences of their use/re-use; Perkins *et al.* (2009) focussed on bullying rather than on the outcomes of bullying, and studies on alcohol-use enabled students to compare their alcohol consumption with that of others, not with the outcomes of that consumption. If this analysis is correct, the social norms approach would be more successful in the domain of energy use if it were applied to individual energy-consuming practices – for example, by giving householders feedback on how often other people use a tumble-drier or how much electricity others use to boil water for hot drinks.

Conclusions

In this study, the addition of social norms information to electricity feedback was found to increase engagement with the feedback (*H3*) but was not found to reduce consumption (*H2*). The research suggests that earlier studies by Nolan *et al.* (2008), Ayres *et al.* (2009) and Allcott (2011) exaggerated the efficacy of the approach because

they failed to control for the influence of individual feedback and thus confounded the effects of social norms feedback and individual feedback. This suggests that social norms data should be a secondary, rather than essential, part of any strategy for achieving reductions. This is of great relevance to the UK Government's Smart Meter programme, its endorsement of Opower's social norm approach (Cabinet Office, 2011) and the adoption of that approach by the UK electricity provider, First Utility (Solon, 2011). The finding also has implications for social marketing in other fields, for it suggests that where it is possible to give people feedback on their own behaviour, the social norms approach might only yield small additional behavioural benefit.

The study suggests that the style of feedback used was engaging to participants and that they found it interesting to associate peaks and troughs in consumption with the activities that caused them. This detailed level of engagement was not possible in earlier studies and is not provided by most other feedback systems such as those that utilised by the real-time display monitors (RTDs) that are an obligatory component of the Smart Meter programme currently being rolled out among the UK's energy providers. As engagement is often one of the greatest challenges facing the efforts of social marketing to change behaviour, this is in itself an important finding. Hargreaves *et al.* (2010) found that the novelty of the consumption feedback provided by existing RTDs is short-lived. This study suggests three ways in which the impact of RTDs could be improved. First, graphs showing both social norms and individual information can help to sustain consumer interest in feedback and thereby increase and extend engagement. Second, frequency of access to the graphs indicates that it would be useful to supplement real-time displays with e-mail and web-based displays of historical data. Third, the presentation of consumption data in hourly blocks helps householders recognise which domestic appliances and activities are responsible for the greatest fluctuations in consumption, thereby enabling them to identify areas where behaviour change would be most worthwhile.

Although smaller than the reductions reported by many earlier studies, a 3 per cent drop in domestic electricity consumption would represent a significant contribution to the UK's goal for reducing carbon dioxide emissions. If the approach used here were also applied to gas and gas heating, which is included in the UK roll-out of RTDs and which may be more susceptible to behaviour change than electricity consumption, the benefits could be higher. This research therefore provides support for the use of feedback to help meet carbon reduction targets.

Limitations and suggestions for further research

Fertile areas for future innovation and research include feedback that clearly identifies the consumption of specific appliances and activities, and the provision of social norms information on particular activities rather than on overall consumption.

Furthermore, alongside the issue of sample size and statistical power, a number of other lessons from this research can be applied to the design of future studies. Although participants were recruited from two socio-demographically different areas, the sample remained unrepresentative of the UK population as a whole. The median gross annual household income (£45,230; SD = £28,899; $N = 239$) suggests that average income was higher than in the UK as a whole, where the average income for those in full-time employment is £26,100 (ONS, 2012). If, as Brandon and Lewis (1999) argue, poorer households respond to consumption feedback with the highest

proportional reductions, it will be important for future studies to sample from a broader socio-economic spectrum. In addition, in the questionnaire, 43 per cent of participants agreed that concern for the environment motivated their participation in the research, suggesting that householders who were more environmentally conscious were overrepresented. Although environmental attitudes are not necessary good predictors of behaviour (Young *et al.*, 2010; Schlegelmilch *et al.*, 1996; Bamberg and Möser, 2007), it is possible that this bias in the sample influenced the size of the reductions identified in this study.

There is also the question of the duration of the consumption monitoring. In the Opower trials, the two-year data collection period allowed more time for the longer-term impacts of the interventions, and Allcott (2011, p. 7) suggests that reductions in consumption were most evident 12 months after the first social norms feedback was provided. In this study, consumption data were collected for 18 weeks (including a two-week baseline period) and there is evidence from the interviews that some changes prompted by the intervention (e.g. the purchase of energy efficient appliances) only occurred after the end of this monitoring period.

Finally, it is possible that the effect size was reduced by the Hawthorne effect – the impact of trial participation on the behaviour of the control group. By reminding householders that they were participating in research, the presence of the monitors may have exacerbated this effect. Even where the monitors were stored away from view, the process of recruitment and monitor installation is likely to have made participants more aware of their consumption even before the interventions began. By reducing the absolute size of changes in consumption between the baseline period and the end of the monitoring period, this may have reduced the size of the effect in the test of *H1*. This phenomenon could be reduced by minimising awareness of participation among the control group or by increasing the impact of the interventions. Advances in technology should make both of these steps possible in future.

Acknowledgements

This research was made possible by financial support from the UK Research Council Digital Economy Programme.

Note

1. Note: a single e-mailed graph could be downloaded more if the e-mail was opened repeatedly by the same person or forwarded to another household member.

References

- Allcott, H. (2011), "Social norms and energy conservation", *Journal of Public Economics*, Vol. 95 Nos 9-10, pp. 1082-1095.
- Armitage, C.J. and Connor, M. (2001), "Efficacy of the theory of planned behaviour: a meta-analytic review", *British Journal of Social Psychology*, Vol. 40, pp. 471-499.
- Asch, S.E. (1987), *Social Psychology*, Oxford University Press, Oxford.
- Ayres, I., Raseman, S. and Shih, A. (2009), "Evidence from two large field-experiments that peer comparison feedback can reduce residential energy usage", *Proceedings of the Annual Conference on Empirical Legal Studies*, Yale University, New Haven, CT, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1434950 (accessed 24 August 2012).

-
- Bamberg, S. and Möser, G. (2007), "Twenty years after Hines, Hungerford and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour", *Journal of Environmental Psychology*, Vol. 27, pp. 14-25.
- Berkowitz, A.D. (2005), "An overview of the social norms approach", in Lederman, L.C. and Stewart, L.P. (Eds), *Changing the Culture of College Drinking: a Socially Situated Health Communication Campaign*, Hampton Press, Cresskill, NJ.
- Bewick, B.M., Trusler, K., Mulhern, B., Barkham, M. and Hill, A.J. (2008), "The feasibility and effectiveness of a web-based personalised feedback and social norms alcohol intervention in UK university students: a randomised control trial", *Addictive Behaviors*, Vol. 33, pp. 1192-1198.
- Birzle-Harder, B. and Götz, K. (2001), "Grüner Strom - eine sozialwissenschaftliche Marktanalyse [Green Power – a sociological market analysis]", Institut für Sozial-ökologische Forschung, Frankfurt, ISOE-Studentexte No. 9.
- Bosari, B. and Carey, K.B. (2003), "Descriptive and injunctive norms in college drinking: a meta-analytic integration", *Journal of Studies on Alcohol*, Vol. 64 No. 3, pp. 331-341.
- Brandon, G. and Lewis, A. (1999), "Reducing household energy consumption: a qualitative and quantitative field study", *Journal of Environmental Psychology*, Vol. 19, pp. 75-85.
- Buchner, A., Erdfelder, E. and Faul, F. (2001), "How to use G*Power", available at: www.psych.uni-duesseldorf.de/aap/projects/gpower/how_to_use_gpower.html (accessed 20 February 2012).
- Burchell, K., Rettie, R. and Patel, K. (n.d.), "Marketing social norms: social marketing and the 'social norm approach'", *Journal of Consumer Behaviour*, forthcoming.
- Cabinet Office (2011), *Behavioural Insights Team Annual update 2010-2011*, Cabinet Office, London.
- Cabinet Office (2012), *Applying Behavioural Insights to Reduce Fraud, Error and Debt*, Cabinet Office, London.
- Carus, G., Passafaro, P. and Bonnes, M. (2008), "Emotions, habits and rational choices in ecological behaviours: the case of recycling and use of public transportation", *Journal of Environmental Psychology*, Vol. 28 No. 1, pp. 58-62.
- Chitnis, M. and Hunt, L.C. (2012), "What drives the change in UK household energy expenditure and associated CO2 emissions? Implication and forecast to 2020", *Applied Energy*, Vol. 94, pp. 202-214.
- Cialdini, R. and Goldstein, N.J. (2004), "Social influence: compliance and conformity", *Annual Review of Psychology*, Vol. 55, pp. 591-621.
- Collier, A., Cotterill, A., Everett, T., Muckle, R., Pike, T. and Vanstone, A. (2010), *Understanding and Influencing Behaviours: a Review of Social Research, Economics and Policy Making in Defra*, Defra, London.
- Darby, S. (2006), *The Effectiveness of Feedback on Energy Consumption, A review for DEFRA of the Literature on Metering, Billing and Direct Displays*, Environmental Change Institute, University of Oxford, Oxford.
- Defra Department of the Environment, Food and Rural Affairs (2006), *An Environmental Behaviours Strategy for DEFRA: a Scoping Report*, Defra, London.
- DECC Department of Energy and Climate Change (2010), *Minutes of the third meeting of the Advisory Forum on the Quality Assurance Scheme for Carbon Offsetting*, DECC, London, available at: <http://coas.aeastaging.co.uk/staging/cms/announcements-archive/> (accessed 4 October 2011).

- DECC Department of Energy and Climate Change (2011), *Digest of United Kingdom Energy Statistics*, DECC, London, available at: www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx (accessed 4 October 2011).
- Dünnhoff, E. and Dusche, M. (2008), "Effiziente Beratungsbausteine zur Minderung des Stromverbrauchs in privaten Haushalten – Endbericht", *Proceedings of the ACEEE 1992 Study on Energy Efficiency in Buildings, 10*, available at: www.ifeu.de/energie/pdf/BW-Stromsparberatung_Endbericht.pdf (accessed 23 August 2012).
- Field, A. (2005), *Discovering Statistics Using SPSS*, 2nd ed., Sage, London.
- Firth, S., Lomas, K.J. and Wright, A.J. (2008), "Identifying trends in the use of domestic appliances from household electricity consumption measurements", *Energy and Buildings*, Vol. 40 No. 5, pp. 926-936.
- Fishbein, M. and Yzer, M.C. (2003), "Using theory to design effective health behaviour interventions", *Communication Theory*, Vol. 13 No. 2, pp. 164-183.
- Fischer, C. (2008), "Feedback on household electricity consumption: a tool for saving energy?", *Energy Efficiency*, Vol. 1 No. 1, pp. 79-104.
- Garay, J. and Lindholm, P. (1995), "Statistics on the energy bill: better control for the customer", *International Energy Program Evaluation Conference, Chicago, IL, August*, pp. 22-25.
- Goldstein, N.J., Cialdini, R.B. and Griskevicius, V. (2008), "A room with a viewpoint: using social norms to motivate environmental conservation in hotels", *Journal of Consumer Research*, Vol. 35 No. 3, pp. 472-482.
- Hargreaves, T. (2011), "Questioning the virtues of pro-environmental behaviour research: towards a phronetic approach", *Geoforum*, Vol. 43 No. 2, pp. 315-324.
- Hargreaves, T., Nye, M. and Burgess, J. (2010), "Making energy visible: a qualitative field study of how householders interact with feedback from smart energy monitors", *Energy Policy*, Vol. 38, pp. 6111-6119.
- HM Government (2009), *The UK Low Carbon Transition Plan: National Strategy for Climate and Energy*, The Stationery Office, London, Government Whitepaper.
- IEA (2005), "Smaller customer energy saving by end use monitoring and feedback", available at: www.ieadsm.org/Files/Tasks/Task%20XI%20-%20Time%20of%20Use%20Pricing%20and%20Energy%20Use%20for%20Demand%20Management%20Delivery/Reports/Subtask1Report12May05.pdf (accessed 23 August 2012).
- Kempton, W. and Layne, L.L. (1994), "The consumer's energy analysis environment", *Energy Policy*, Vol. 22 No. 10, pp. 857-866.
- Leech, N.L. and Onwuegbuzie, A.J. (2009), "A typology of mixed methods research designs", *Quality & Quantity*, Vol. 43, pp. 265-275.
- Lewis, M.A. and Neighbors, C. (2006), "Social norms approaches using descriptive drinking norms education: a review of the research on personalised normative feedback", *Journal of American College Health*, Vol. 54, pp. 213-218.
- McAlaney, J. and McMahan, J. (2007), "Normative beliefs, misperceptions, and heavy episodic drinking in a British student sample", *Journal of Studies on Alcohol and Drugs*, Vol. 68, pp. 228-237.
- McKenzie-Mohr, D., Lee, N.R., Schultz, P.W. and Kotler, P. (2012), *Social Marketing to Protect the Environment*, Sage, Los Angeles, CA.
- McNeill, M. (2012), "The UK E-mail Marketing Benchmark Report 2012", *Sign-Up Technologies*, available at: www.sign-up.to (accessed 17 August 2012).
- Milgram, S. (1974), *Obedience to Authority: An Experimental View*, Tavistock Publications, London.

- Moreira, M.T., Smith, L.A. and Foxcroft, D. (2009), "Social norms interventions to reduce alcohol misuse in university or college students", *Cochrane Database of Systematic Reviews*, Vol. 8 3, July, available at: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006748.pub2/full> (accessed 4 October 2011).
- Neighbors, C., Labrie, J.W., Hummer, J.F., Lewis, M.A., Lee, C.M., Sruti, D., Kilmer, J.R. and Larimer, M.E. (2010), "Group identification as a moderator of the relationship between perceived social norms and alcohol consumption", *Psychology of Addictive Behaviors*, Vol. 24 No. 3, pp. 522-528.
- Neighbors, C., O'Connor, R.M., Lewis, M.A., Chawla, N., Lee, C.M. and Fossos, N. (2008), "The relative impact of injunctive norms on college student drinking: the role of the reference group", *Psychology of Addictive Behaviours*, Vol. 22 No. 4, pp. 576-581.
- Nolan, J.M., Schultz, P.W., Cialdini, R.B., Goldstein, N.J. and Griskevicius, V. (2008), "Normative social influence is underdetected", *Personality and Social Psychology Bulletin*, Vol. 34 No. 7, pp. 913-923.
- Nomura, H., John, P. and Cotterill, S. (2011), *The Use of Feedback to Enhance Environmental Outcomes: A Randomized Controlled Trial of a Food Waste Scheme*, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1760859 (accessed 4 October 2011).
- ONS (2012), *Annual Survey of Hours and Earnings, 2011 Provisional Results (SOC 2010)*, Office for National Statistics, London, available at: <http://www.ons.gov.uk/ons/rel/ashes/annual-survey-of-hours-and-earnings/2011-provisional-results-soc-2010/stb-ashes-results-2011-soc-2010.html> (accessed 30 August 2012).
- Perkins, H.W. (2003), *The Social Norms Approach to Preventing School and College Age Substance Abuse*, Jossey-Bass, San Francisco, CA.
- Perkins, H.W., Craig, D.W. and Perkins, J. (2009), "Misperceptions of bullying norms as a risk factor associated with violence among middle school students", paper presented at American Public Health Association Annual Meeting, Philadelphia, PA, November 10, 2009, available at: www.youthhealthsafety.org/MispercepBullyNormsAPHA09Handouts.pdf (accessed 4 October 2011).
- Thaler, R.H. and Sunstein, C.R. (2008), *Nudge: Improving Decisions about Health, Wealth and Happiness*, Yale University Press, London.
- Schlegelmilch, B.B., Bohlen, G.M. and Diamantopoulos, A. (1996), "The link between green purchasing decisions and measures of environmental consciousness", *European Journal of Marketing*, Vol. 30 No. 5, pp. 35-55.
- Schultz, P.W. (1999), "Changing behavior with normative feedback interventions: a field experiment on curbside recycling", *Basic and Applied Social Psychology*, Vol. 21 No. 1, pp. 25-36.
- Schultz, P.W., Nolan, J.M., Cialdini, R.B., Goldstein, N.J. and Griskevicius, V. (2007), "The constructive, destructive, and reconstructive power of social norms", *Psychological Science*, Vol. 18 No 5, pp. 429-434.
- Solon, O. (2011), "Opower's data crunching service comes to the UK", *Wired.co.uk*, September, available at: www.wired.co.uk/news/archive/2011-07/08/Opower-launches-in-the-uk (accessed 4 October 2011).
- Van Raaij, W.F. and Verhallen, T.M.M. (1983), "A behavioural model of residential energy use", *Journal of Economic Psychology*, Vol. 3 No. 1, pp. 39-63.
- White, K.M., Smith, J.R., Terry, D.J., Greenslade, J.H. and McKimmie, B.M. (2009), "Social influence in the theory of planned behaviour: the role of descriptive, injunctive, and in-group norms", *British Journal of Social Psychology*, Vol. 48, pp. 135-158.

- Whitmarsh, L., Seyfang, G. and O'Neill, S. (2011), "Public engagement with carbon and climate change: to what extent is the public 'carbon capable'?", *Global Environmental Change*, Vol. 21, pp. 56-65.
- Wilhite, H. (1997), "Experiences with the implementation of an informative energy bill in Norway", Oslo, Ressurskonsult Report 750.
- Young, W., Hwang, K., McDonald, S. and Oates, C.J. (2010), "Sustainable consumption: green consumer behaviour when purchasing products", *Sustainable Development*, Vol. 18 No. 1, pp. 21-31.

Further reading

- Hirsch, A.R. (1995), "Effects of ambient odours on slot-machine usage in a Las Vegas casino", *Psychology and Marketing*, Vol. 12 No. 7, pp. 585-594.
- John, P., Smith, G. and Stoker, G. (2009), "Nudge, nudge; think, think: two strategies for changing civic behaviour", *The Political Quarterly*, Vol. 80 No. 3, pp. 361-370.

Appendix

Condition	Social norm message	Injunctive-norm message
Consumption above average for those in the social norms condition	"Your energy consumption was above average"	None
Consumption 0-30 per cent lower than average	"Your energy consumption was just below average"	"Well done, keep it up!"
Consumption 31-59 per cent lower than average	"Your energy consumption was well below average"	"Well done, keep it up!"
Consumption lower than average by 60% +	"Your energy consumption was among the best 20 per cent"	"Well done, keep it up!"

Table AI.
Messages displayed on graphs for members of the social norms group

About the authors

Tim Harries is Senior Research Fellow in the Behaviour and Practice Research Group at Kingston University. He specialises in applying sociology and social psychology to understanding behaviours around risk, sustainability and climate change adaptation/mitigation and previously worked for ten years in applied policy research and policy making. Currently, he is responsible for running the EPSRC-funded CHARM suite of research programmes. In addition, as Co-I on another EPSRC project, he is investigating ways of maximising the benefits of agent-based models for organisations seeking to adapt to flood risk. Tim Harries is the corresponding author and can be contacted at: t.harries@kingston.ac.uk

Ruth Rettie is Professor of Social Marketing and Director of the Behaviour and Practice Research Group at Kingston University. Her background is interdisciplinary, combining philosophy (MA, BLitt, BPhil), an MBA, a PhD in sociology and ten years as a brand manager. Professor Rettie's work is published in many journals and in several disciplines. Her current research applies social marketing and sociological perspectives to the adoption of sustainable behaviours. Professor Rettie is principal investigator of CHARM (EPSRC) and Smart Communities (ESRC); part of the Low Carbon Communities Challenge evaluation team (DECC) and a co-ordinator of the Sustainable Society Network + .

Matthew Studley has worked in research and development in the telecommunications, e-business, investment and finance sectors in many European countries, the USA and Australia, and currently leads the undergraduate Robotics Programme at UWE. He has run several high profile public engagement projects that bring robotics issues to the attention of the public, including the internationally recognised “Heart Robot” project. He is currently involved in using distributed sensing to change domestic electricity consumption and using distributed energy storage to improve UK energy security.

Dr Kevin Burchell is Senior Research Fellow and Deputy Director of the Behaviour and Practice Research Group at Kingston University. With an interpretative social science training, he has research interests in the social dimensions of the shaping of behaviour and practice, particularly within the contexts of energy and sustainability, community action and social and green marketing. Dr Burchell is co-investigator of Smart Communities (ESRC), contributes to CHARM (ESPRC) and is part of the Low Carbon Communities Challenge evaluation team (DECC).

Simon Chambers was the Research Associate on the CHARM project and designed and manufactured all the hardware and software systems for the project. He specialises in electronics and software design and development. Prior to his time on the CHARM project, Simon studied for the BSc Robotics at the University of the West of England and he has industrial experience of professional hardware and software development in a number of domains. Simon’s professional interests are robotics, telecommunications, energy efficiency and control systems.



Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.