Grainger MJ, Stewart GB.

The jury is still out on social media as a tool for reducing food waste a response to Young et al. (2017).

***Resources, Conservation and Recycling* 2017, 122, 407-410**

Title: The jury is still out on social media as a tool for reducing food waste a response to Young et al. (2017).

Matthew James Grainger* and Gavin Bruce Stewart

School of Agriculture, Food and Rural Affairs, Agriculture Building, Newcastle University, Newcastle upon Tyne, NE1 7RU, UK

* Corresponding author

Young et al. (2017) pose an important question "Can social media be a tool for reducing consumers' food waste?" Consumer food waste is thought to account for the largest proportion of all food waste in developed countries (Parfitt et al. 2010). In the 28 European Union countries consumer food waste constitutes between 46.7 and 63.5% of the total estimated food waste of 87.6 ±13.7 (95% CI) million tonnes (Stenmarck et al. 2016). Efforts to reduce this level of waste have increasingly become important for governments and civil society in the interests of environmental sustainability and cost reduction. Young et al. (2017) in collaboration with a major UK supermarket company aimed to assess the influence of social media (Facebook) interventions on self-reported food waste behaviour in comparison to information interventions (Asda Magazine and e-newsletter) and a control group. This was done in a "field" situation and not a tightly controlled experiment; hence Young et al. (2017) could be an important contribution to our understanding of behaviour change in relation to food waste interventions.

Young et al. (2017) report that there was no difference in the performance of the social media intervention when compared to the information interventions or to the control group. They suggest that all groups (interventions and controls) showed a statistically significant reduction in self-reported frequency and quantity of food waste. Despite reporting the effect size (0.01),

Young et al. do not discuss the magnitude of the effect. Statistical significance means very little in the absence of effect size (Sullivan & Feinn 2012) and a minimal (0.01) effect size means that there was very little change in behaviour. With regard to the category of food wasted a statistically significant decrease in salad waste is reported and Young et al. (2017) suggest this is driving the pattern observed in the frequency and quantity of food wasted over the three time periods. Once again the effect size was minimal (0.01) and the magnitude was not discussed.

Here, the effect size represents the magnitude of the difference between the mean of a test and a control group (Sullivan & Feinn 2012). It is important to note that a small effect size can be meaningful (Bayliss et al. 2015). So called “t-shirt size” effects have been criticised and it is essential that one relates the effect size to the data presented as an effect size of 0.4 (for example) could be meaningful in one study and not in another (Kline 2009). Young et al. (2017) do not provide any indication of why they consider such a small effect size behaviourally significant and do not provide the data behind their work (presumably due to commercial confidentialities) to allow researchers to assess this independently.

The data on the frequency of waste is scaled between 1, “Never” and 5 “Most mealtimes” (the intervening values are not defined in Young et al.). The mean values range between 2.36 and 2.63 measured on a 5 point likert scale. We used the R programme (R Core team 2016) to simulate data with a similar structure to that of Young et al. (2017) using the means and standard deviations as presented in Table 1 of their Appendix (all R code is available at: https://osf.io/sqd8g/?view_only=27b3f2c5f1684a388ec59c0d100e7a3b). We produced 10000 simulated datasets (Figure1a) and tested these with one-way repeated measures ANOVA and then extracted the p values for these tests (Figure 1b). The distribution of the datasets (Figure

1a) shows that the different time periods greatly overlap. Only 46.6% of the 10000 tests run resulted in a p value less than 0.05 (Figure 1b).

Young et al. (2017) also report the statistically significant results of t-tests comparing time periods for different interventions. For example, again for the frequency of food wasted, those people exposed to the Facebook intervention reported a change in behaviour from Time 1 (M=2.47, SD=0.91) to Time 3 (M=2.41, SD=0.91). Again using simulation (10000 iterations) we applied t-tests to the data. Only 17.07% of the 10000 tests resulted in a p value less than 0.05 (Figure 2a). The minimal absolute difference between means to achieve a statistically significant result (i.e. $p<0.05$) is around 0.1 of a likert scale (Figure 2b).

Hence, from the data that are presented in Young et al. (2017) and our simulations we would conclude that there was a small statistically significant effect but no behaviourally significant effect of the interventions and of time on food waste behaviour. It is clear from our simulations (Figure 1b) that the sample size (n = 2018) was too small to adequately identify an effect if one was there. This in combination with the small effect size and the reliance on self-reported measures of food waste (which is acknowledged by Young et al. 2017) increases the risk of bias.

Young et al. (2017) suggest that their paper shows that “social media…cannot replicate enough of the interaction shown by face to face social influence interventions to change reported behaviour more than the control group (those that did not see the interventions)”. This statement is premature considering the weight of knowledge that has been accumulated in the behaviour change literature in fields such as psychology and medicine as over the past decade. Meta-analysis has consistently reported small but positive effect sizes of online

interventions on behaviour change (Wantland et al. 2004; Barak et al. 2007; Maher et al. 2014; Short et al. 2014). The heterogeneity observed in these meta-analytical studies has been attributed to the type and number of behaviour change techniques employed. Using individually targeted interventions online with repeated reminders is more effective than a single non-targeted approach (Short et al. 2014).

Rather than suggesting that social media cannot be used as an effective behaviour change agent in the realm of food waste we suggest that Young et al. (2017) well illustrates the importance of evidence-synthesis. The lack of behaviour change from a small sample of people (albeit a sample size that is typical in consumer research) in a study with an untargeted intervention provides one small piece of the jigsaw. The jury is still out on the potential for social media to influence behaviour change and hence reduce food waste but it is imperative that evidence still be collected and a variety of intervention strategies assessed. Disregarding social media as a potential effective intervention on the basis of any single study would be irresponsible and should not be advocated. Lack of evidence synthesis coupled with (over)reliance on p values may be seriously distorting the evidence-base in this important area of consumer behaviour .

References

Barak, A., Hen, L., Boniel-Nissim, M. Shapira, N. 2007. A comprehensive review and a meta-analysis of the effectiveness of internet-based psychotherapeutic interventions. J. Technol. Human Serv., 26, 109 – 160.

Bayliss, H. R., Lortie C.J., Stewart, G.B. 2015. How "good" is half a fish? Communicating outcomes of quantitative syntheses to decision makers. Front. Ecol. Evol., 13, 533 – 534.

Kline, R.B. 2009. Becoming a behavioural researcher; a guide to producing research that matters. The Guildford Press, London.

Maher, C.A., Lewis, L.K., Ferrar, K., Marshall, S., De Bourdeaudhuij, I., Vandelanotte, C. 2014. Are health behavior change interventions that use online social networks effective? A systematic review. J. Med. Internet Res. 16, e40.

Parfitt, J., Barthel, M., Macnaughton, S. 2010. Food waste within food supply chains: quantification and potential for change to 2050. Phil. Trans. R. Soc. B, 365, 3065 – 3081.

R Core Team. 2016. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

Short, C., Rebar, A.L., Plotnikoff, R.C., Vandelanotte, C. 2014. Designing engaging online behaviour change interventions: A proposed model of user engagement. The Euro. Health Psyc., 17, 32 – 38.

Stenmarck, Å., Hansen, O.J., Silvennoinen, K., Werge, M., Katajajuuri, J.M., 2011. Initiatives on prevention of food waste in the retail and wholesale trades, Stockholm: IVL - Swedish Environmental Research Institute.

Sullivan, G. M., Feinn, R. 2012. Using effect size – or why the P value is not enough. J. Grad. Med. Educ. 4, 279 – 282.

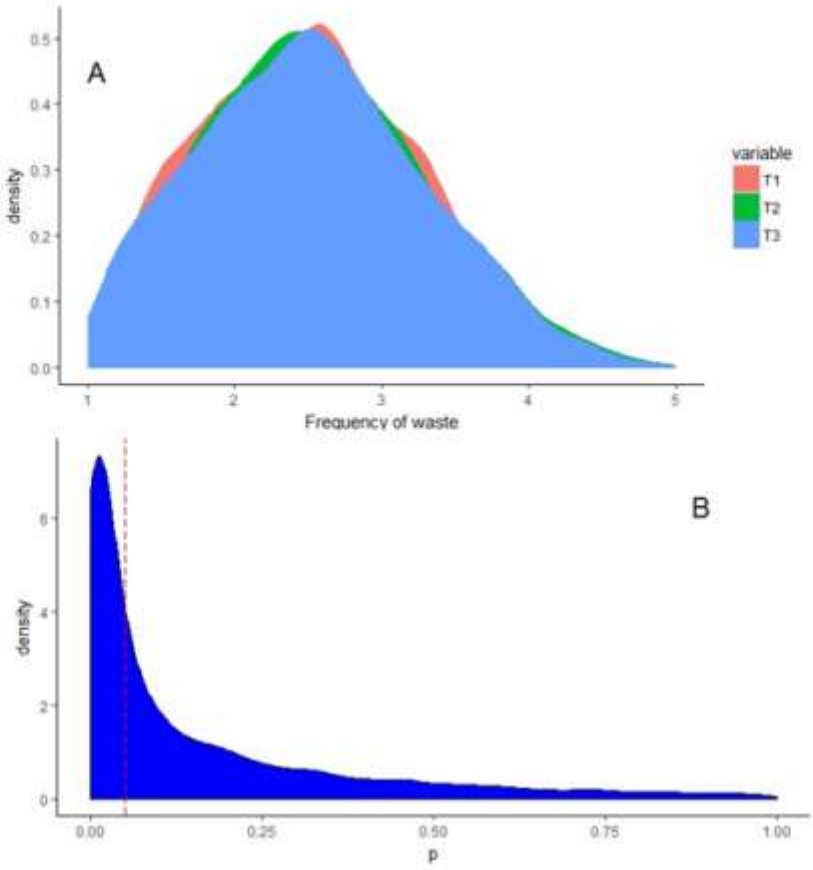
Wantland, D.J., Portillo, C.J., Holzemar, W.L., Slaughter, R., McGhee, E.M. 2004. J. med. Internet Res. 10, e40.

Young, W., Russell, S.V., Robinson, C.A. Barkemeyer, R. 2017. Can social media be a tool for reducing consumers' food waste? A behaviour change experiment by a UK retailer. Resour. Conserv. Recycl., 117, 195 – 203.

Figure legends

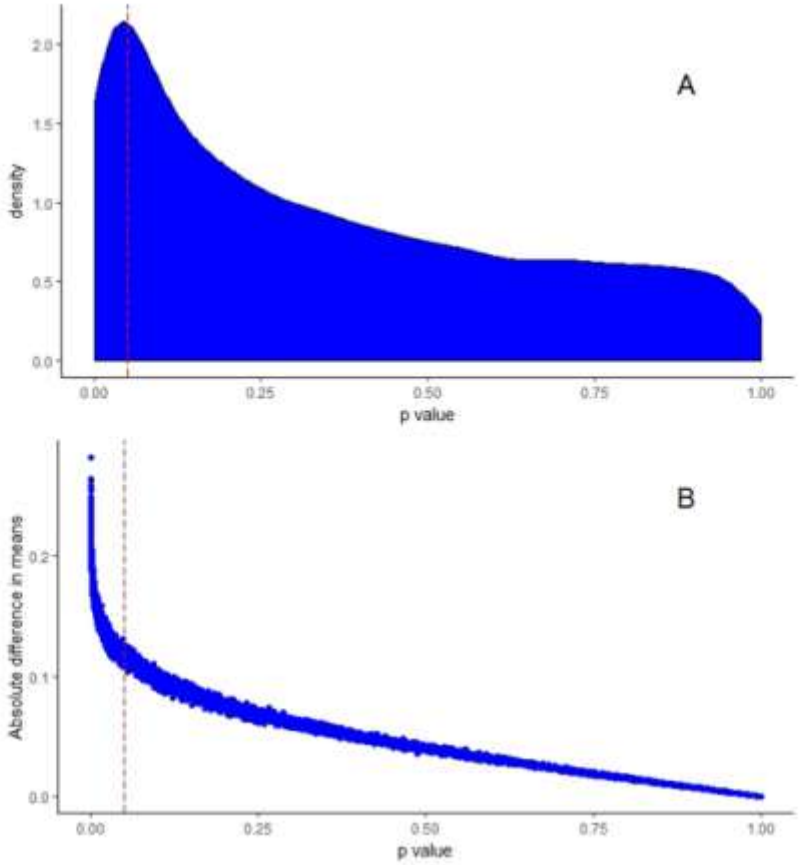
Figure 1. a) The distribution of data for the frequency of waste in Time period 1 to 3 for the 10000 simulations of data based on the means and standard deviations reported in Young et al. (2017). b) The distribution of p-values for one-way repeated measures ANOVA on the 10000 simulated datasets. The red dashed line indicates alpha = 0.05.

Figure 2. a) The distribution of p values for t-tests on 10000 simulated datasets for frequency of food waste in response to the Facebook intervention. b) The absolute difference between means needed to produce a statistically significant result for the 10000 simulated t-tests. The red line indicates alpha= 0.05.


A
density
0.5
0.4
0.3
0.2
0.1
0.0
1
2
3
4
5
Frequency of waste
variable
T1
T2
T3
B
density
6
4
2
0
0.00
0.25
0.50
0.75
1.00
p

140

141


A
density
2.0
1.5
1.0
0.5
0.0
0.00
0.25
0.50
0.75
1.00
p value
B
Absolute difference in means
0.2
0.1
0.0
0.00
0.25
0.50
0.75
1.00
p value

142