

Backfiring, reactance, boomerang, spillovers, and rebound effects: Can we learn anything from examples where nudges do the opposite of what they intended?

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Abstract: The academic literature continues to amass a vast amount of empirical work examining the effect of nudges in a variety of contexts designed to improve life style choices in alignment with social policies. In fact, the literature is so vast, there are now meta-analytic studies designed to determine the overall effects of different types of nudges used in a variety of domains (e.g. chronic health, weight management, managing personal finances, pro-environmental behaviours). At the same time, there is also an amassing literature on backfire effects (of which 65 studies are referred to in this article). These are examples where the introduction of a nudge (e.g. a default, social norming, framing, information provision) generates behavioural change in the opposite direction of what was intended. The approach taken here is that there is much that can be learnt from when nudges go wrong, and the insights can be used to indicate where improvements can be made for designing nudges to support better decision-making.

Introduction:

In the University of Vermont in Burlington, Vermont USA, in August 2012, in order to respond to the Alliance for a Healthier Generation's beverage guidelines, all campus locations selling bottle beverages changed the ratio of healthy to less healthy beverages so that 30% of options were healthy. This might constitute a nudge in that the financial incentives didn't change, only the choice architecture, in this case, the proportion of healthy to unhealthy beverages, designed to signal (implicitly or otherwise) that healthier options ought to be selected.

In January 2013, additional changes were made such that now campus sales locations were required to remove bottled water, but at the same time maintaining the 30% ratio of healthy to less healthy beverage options. This might be seen as a non-nudge, given that the choice architecture was changed in such a way that an option that was present before was removed. But the intention regarding behavioural change remained the same, which was to increase the selection of healthy beverages.

At the same time, further changes were made on campus with the aim of promoting healthy beverage consumption, while also reducing environmental impact. To achieve this, the spouts of sixty-eight water fountains were retrofitted so that consumers could reuse bottles by filling them up with water from the fountains, thus reducing wastage of plastic bottles. Alongside this several other measures were included, such as educational campaigns altering as well as explaining the changes to the campus water fountains, free reusable bottles, and stickers promoting the use of reusable bottles. These latter measures would constitute transparent nudges in that they are examples of provisions of information designed to signal and explain changes in the choice architecture in order to encourage increases, in this case, in healthier beverage consumption, and at the same time reducing environmental impact.

The outcome on beverage consumption and littering was monitored for the period of the introduction of all these interventions. Overall, consumption of less healthy beverages increased, bottled water sales dropped to zero, and given the overall rise in consumption of bottled beverages, wastage was likely to have increased rather than decreased. In sum, this presents an example of backfiring. That is, the outcomes observed following the interventions (most of which were nudges) were in the opposite direction to what had been intended.

The question that this raises is why? One reason that potentially explains one of the backfiring effects is that, depending on location, consumers are concerned about the water quality and purity of drinking of water (Choate et al 2018; Leveque et al, 2018). Moreover, there can be good reasons for such concerns because if, at the time, there are news reports in the local area of contaminants in the water, and/or poor water quality testing facilities, then there is likely nervousness towards relying on drinking water (as was the case in several news reports). This provides a context for why banning water bottles on University of Vermont in Burlington campuses wasn't enough to encourage consumers to switch to using freely available water from drinking fountains. One reason for explaining the second backfiring effect, which saw an increase in consumption of less healthy beverages following the introduction of changes in the proportion of healthy to less healthy options, along with a ban on bottled water, is reactance. This is a well-documented psychological effect (Brehm, 1966) *"Psychological reactance theory (PRT; Brehm, 1966) posits that when something threatens or eliminates people's freedom of behavior, they experience psychological reactance, a motivational state that drives freedom restoration."* In the case of the present example the less healthy options weren't eliminated, but the signal was that their availability was reduced, which in turn may have likely increased their attractiveness, as well as promoting a need to restore a potentially perceived slight on a liberty to choose, thus leading to an increase in consumption of less healthy beverages.

The objective of this paper is to raise the same question across several empirical studies of backfiring effects and to consider the range of failures, and the contexts in which they emerge.

Search strategy

It is important to emphasise that what was conducted was not a systematic review. The purposes of this paper was to gather examples of interventions that capture the range of possible idiosyncratic failures so as to enable future researchers to build on this, and to examine the range and type of failures that have been published in the literature. The emphasis also was on looking at a range of failures for which studies that simply reported null effects that are included here are illustrative. The reason for this is that there are actually a considerable number of studies that report null effects of trialled interventions and that feature in several large scale meta-analyses that have been carried out on behavioural interventions targeting different policy domains. For examples: Blood glucose monitoring (Avery et al, 2012; Cradock et al, 2017), Self-care management (Jonkman et al., 2016; Macea at al., 2010), increasing physical activity (Conn et al., 2011; Hobbs et al., 2013), weight management in the child domain (Heerman et al., 2017; Hung et al, 2015; Ludwig et al., 2018; Sim et al, 2016) and adult domain (Curry et al., 2018; de Vries et al., 2016; Hutchesson et al., 2015; Seo & Niu, 2015), increasing financial literacy (Hastings et al., 2013; Kaiser & Menhoff, 2017; Miller et al, 2014), and increasing pro-environmental behaviours (Abrahamse & Steg, 2013; Delmas et al., 2013; Karlin et al., 2015; Lokhort et al., 2013; Nisa, 2018)¹.

Inclusion criteria for the purposes of this paper

We used search terms *behavioural change*, *behavioural intervention*, *nudge*, *nudging*, and focused our search in web of science between the year 2008 to 2019. This search generated a total of 6,962 articles. We filtered these to include only articles that referred to terms *backfire*, *spillovers*, *rebounds*, and *boomerang* effects, and excluded all review articles, meta-analyses, and articles for which the specific intervention trialled was a mandate, tax, or ban. We did however include an article that included a tax, because it was combined with other interventions. This reduced the list down to 30 articles.

The same search terms were also entered into google scholar for the same period in order to capture any articles that were not on the web of science data base, this search generated 24,100 articles. The inclusion criteria that were applied, then reduced the list down to 230 article.

The full table with classification of the papers according to criteria applied is presented below, the final list of article included were 65.

The organisation of the table is such that the essential details of the studies are presented. These included, the authors of the study, date, and title, along with the country where the study took place (most often as an index of the key sample population), type of study, the design, the context – this is the domain in which the intervention(s) were applied, and the type of behavioural intervention that was implemented, and a summary of the critical findings (for which the details in many cases were taken directly from the abstracts, conclusions, and general discussion sections of the articles themselves).

¹ All references to meta-analytic studies appear in a separate section in the references list at the end of this paper.

When interventions fail

	Authors	Date	Title	Sample	Type of study	Design	Context	Type of intervention	Findings
1	Allcott, H.	2011	Social norms and energy conservation.	USA	Field study	RCT	Environment - Energy efficiency	Information provision + social norm; Baseline (not sent information via email), regular letters on home energy reports	Findings reporting deciles of the distribution of baseline usage show again normalized by Control group average consumption in the post-treatment period. These effects range from almost zero for the bottom two deciles of baseline usage to 6.4 percent in the top ten percent. In general, the more electricity a household used before the treatment, the more that it conserved post-treatment. This could be because the most consumptive households had low cost energy conservation opportunities, and the tips contained in the Reports made them aware of this. This result is also consistent with the "boomerang effect" model, under which previously low-consumption households might not conserve - or might even consume more - after receiving information that they are less consumptive than their peers.
2	Arad & Rubinstein	2018	The People's Perspective on Libertarian-Paternalistic Policies	German, USA, Israel	Online Studies (report on Exp1)	Attitudinal + hypothetical choice experiment	Savings, arrangement (%) of salary to savings accounts	default - opt-in, opt-out	The default arrangement is perceived as attractive when the government is not involved, which is reflected in the high percentage of those choosing to opt-in
2	Arad & Rubinstein	2018	The People's Perspective on Libertarian -Paternalistic Policies	as above	Online Studies (report on Exp2)	Attitudinal + hypothetical choice experiment	healthy eating in restaurants-hard and soft measures to support	prohibiting eating fatty foods in restaurants, Tax, Ordering of foods on menus by healthiness, App informing nutritional value of meals.	To conclude, we measure (a) the proportion of participants who object to any government intervention in the public's eating habits (Screen 1), (b) the proportion of participants in T1 and T2 who have strong preferences for information and are ready to sacrifice effectiveness so that App (rather than Order) will be adopted, and (c) the correlation between "not opposing" Order (not willing to sacrifice effectiveness) and "not opposing" Tax or Prohibition (in T1 and T2, respectively).
2	Arad & Rubinstein	2018	The People's Perspective on Libertarian -Paternalistic Policies	as above	Online Studies (report on Exp3)	Attitudinal + hypothetical choice experiment	healthy eating in the work place- hard and soft measures to support	green labelling of foods, background music to unconsciously influence healthy eating,	The preference for the green labelling informational intervention over the background music intervention
3	Ariel	2012	DETERRENCE AND MORAL PERSUASION EFFECTS ON CORPORATE TAX COMPLIANCE: FINDINGS FROM A RANDOMIZED CONTROLLED TRIAL	Israel corporations	Field Study	RCT - behavioural	Tax reporting behaviour	Tax letters to encourage compliance through deterrent message, or through moral persuasion	The results indicate that both approaches have not produced positive effects on tax compliance in terms of tax payments and the reporting of these corporate taxpayers' gross sales and services. Thus, whether sanction threats or moral appeals to the corporation's sense of morality are used, neither generate more or less compliance from corporate taxpayers compared with control conditions. Deterrence continues to be, on average, an ineffective practice, with the effect size being virtually non-existent and generally unstable ($g = .005$). Therefore, on average, it seems that corporate taxpayers who are deterred with a sanctioning threat do not ask for more or less deductions than those who did not receive a tax letter. At the same time, a persuasion letter produced a backfiring effect in terms of deductions. Tax deductions were approximately four times higher than the control group, with an overall small, yet statistically significant, effect ($g = .058$).
4	Arshad, Anderson, & Sharif	2019	Comparison of organ donation and transplantation rates between opt-out and opt-in systems	Global	Field Study	Comparison of behavioural data - organ donation rates	Organ donation	default - opt-in, opt-out	Overall, no significant difference was observed in rates of kidney,(35.2 versus 42.3 respectively), non-renal (28.7 versus 20.9,respectively), or total, solid organ transplantation,(63.6 versus 61.7, respectively). In a multivariate linear, regression model, an opt-out system was independently, predictive of fewer living donors but was not associated, with the number of deceased donors or with, transplantation rates. Apart from the observed difference, in the rates of living donation, our data demonstrate no significant difference in deceased donation or solid organ, transplantation activity between opt-out versus opt-in, countries. This suggests that other barriers to organ donation must be addressed, even in settings where consent for donation is presumed.
5	Ayres, I., Raseman, S., & Shih, A.	2013	Evidence from two large field experiments that peer comparison feedback can reduce residential energy usage.	USA	Field study 1 (there were two)	RCT	Environment - Energy efficiency	baseline vs. feedback on usage, social comparison (usage of consumption relative to nearby neighbours in similar size homes)	The experiments analysed here do contradict the findings of the San Marcos study to the extent we found a —boomerang effect for both SMUD and PSE. The boomerang effects are not problematic, however, as reports can be targeted only at households where a boomerang effect is not expected.
6	Azmat, Bagues, Cabrales, & Iriberry	2016	What You Don't Know... Can't Hurt You? A Field Experiment on Relative Performance Feedback in Higher Education	Spain	Field Study Longitudinal (3 years)	RCT - behavioural	Educational Feed	relative performance feedback	The treatment significantly improves the students' self-assessment. We find that treated students experience a significant decrease in their educational performance, as measured by their accumulated GPA and number of exams passed, and a significant improvement in their self-reported satisfaction, as measured by survey responses obtained after information is provided but before students take their exams. Moreover, the negative effect on performance is driven by those students who underestimate their position in the absence of feedback. Those students who overestimate initially their position, if anything, respond positively.
7	Bacon, L., Krpan, D	2018	(Not) Eating for the	U.K.	Online Study	RCT	Healthy eating/sustainable	Framing, messaging and arrangement of	The results showed that the recommendation and descriptive menus increased the likelihood of vegetarian dish choices for infrequent eaters

When interventions fail

			environment: The impact of restaurant menu design on vegetarian food choice				consumption	menu information - Recommended meals	of vegetarian foods, whereas these effects tended to reverse for those who ate vegetarian meals more often. The vegetarian menu had no impact on the infrequent vegetarian eaters' choice but backfired for the frequent vegetarian eaters and made them less likely to order a vegetarian dish.
8	Bartke, S., Friedl, A., Gelhaar, F., & Reh, L.	2016	Social comparison nudges. Guessing the norm increases charitable giving.	Germany	Field Study	RCT	Charity Donations	baseline, Social norm, "guess the norm"	We additionally find tentative evidence that subjects with guesses above the norm donate less than those with guesses below the norm.
9	Belot, M., James, J., & Spiteri, J.	2019	Facilitating Healthy Dietary Habits: An Experiment with a Low Income Population	U.K.	laboratory Study	RCT	healthy eating	Tailored information treatment group was provided with personalized health information via an adapted version of a computer-based health assessment tool called 'Your Disease Risk' (YDR)	We introduce two sources of experimental variation, one where we provide easy-to-digest health information, generalized (generic) and personalized (tailored); and a second where we vary the time available to shop for a basket of food. There was a significant effect on the amount of calories chosen, but no significant effect on other measures of processing and choosing options in response to nutrient information.
10	Berman & Johnson	2015	The Unintended Consequences of Changes in Beverage Options and the Removal of Bottled Water on a University Campus	USA	Field Study Longitudinal (3 semesters)		Environment and health - reduction of consumption of unhealthy drinks and reduction of usage of bottled drinks.	restructuring choices banning water bottles public campaign	Results. Per capita shipments of bottles, calories, sugars and added sugars increased significantly when bottled water was removed. Shipments of healthy beverages declined significantly, whereas shipment of less healthy beverages increased significantly. As bottled water sales dropped to zero, sales of sugarfree beverages and sugar-sweetened beverages increased. Conclusions. The bottled water ban did not reduce the number of bottles entering the waste stream from the university campus, the ultimate goal of the ban. With the removal of bottled water, consumers increased their consumption of less healthy bottled beverages.
11	BeShears, Choi, Laibson, Madrian, & Milkman	2015	THE EFFECT OF PROVIDING PEER INFORMATION ON RETIREMENT SAVINGS DECISIONS	USA	Field Study	Stratified randomization scheme	Retirement savings	Social Comparison	We document an oppositional reaction: the presence of peer information decreased the savings of non-participants who were ineligible for 401(k) automatic enrolment, and higher observed peer savings rates also decreased savings. Discouragement from upward social comparisons seems to drive this reaction
12	BeShears, Dai, Milkman, & Benartzi	2016	Framing the Future: The Risks of Pre-Commitment Nudges and Potential of Fresh Start Messaging	USA	Field Study	RCT - behavioural	Retirement savings	Framing [baseline] sign up to save more immediately, Framing [delay] sign up to save more after a delay [ranging from 2 to 6 months], Framing [explicit 'framed' delay] sign up to save [following e.g. your next birthday/Valentine's day]	First, it demonstrated that relative to offering people the option to save more at a standard time delay (e.g., "in two months"), associating a delayed savings option with an upcoming temporal landmark—particularly with an employee's next birthday—can increase average retirement savings contribution rates. Second, contrary to past research on the benefits of pre-commitment, offering a standard delay option does not lead more people to sign up to increase their savings; if anything, (insignificantly) fewer people sign up to increase their savings. In fact, the presence of a standard delay option decreases overall retirement wealth because some people select the delayed option and thus save over a shorter time horizon than they would have otherwise.
12	BeShears, Dai, Milkman, & Benartzi	2016	Framing the Future: The Risks of Pre-Commitment Nudges and Potential of Fresh Start Messaging	USA -	Laboratory Study	RCT - Attitudinal	Retirement savings	Messaging strategies for retirement savings - no delay [sign up to retirement immediately, standard delay [immediately or start after 6 months], Combination of no delay + follow up if no response]	The laboratory experiment indicates that when a nudge allows people to pre-commit to engaging in a good behaviour "later," it leaks the message that the target behaviour is not an urgent priority, which may explain why this nudge backfired in our field experiment.
13	Bicchieri, Dimant &	2018	Deviant or Wrong? The	USA	Laboratory Study	RCT	Compliance "generally"	Social Comparison "norm" information -	We find that reciprocity is significantly increased when normative information and punishment are combined, but only when compliance

When interventions fail

	Xiao		effects of norm information on the efficacy of punishment				with regulations	Normative messages about what ought to be done "moral", and Normative messages about what others had actually done "empirical", with or without consequences - through punishment	is relatively cheap. When compliance is more expensive, we find that the combination of punishment and empirical information about others' conformity can have detrimental effects on reciprocity
14	Bicchieri, Dimant, Gächter & Nosenzo (2019)	2019	Social Proximity and the Evolution of Norm Compliance	USA	Online Study	RCT + Belief Elicitation and attitudinal	Charity Donations	Social Comparisons	Overall, we find that exposure to peers drives the erosion of norms by facilitating the spread of norm violations in that individuals react to anti-social behaviour (taking) but not to pro-social behaviour (giving). In the presence of social proximity, however, individuals are influenced by observing both examples of norm violations and norm compliance. Both negative and positive behaviours are contagious, spread within groups, and end up stabilizing the donation norm roughly at its initial level.
15	Bolton, Diman, Schmidt	2018	When a nudge backfires: Using observation with social and economic incentives to promote pro-social behavior	German	Online Study	RCT	Charity Donations	Social Comparison Norming	The combined evidence from the first experiment (laboratory), and the second experiment (MTurk) lead us to the conclusion that social image observation, that is being observed by an otherwise uninvolved third party without the ability to enforce behaviour, can boost both pro- and anti-social behaviour, especially the extent to which either behaviour occurs. Not only does the social image nudge fail to yield the expected benefit, it even creates a significant backfiring effect.
16	Brandon, A., Ferraro, P. J., List, J. A., Metcalfe, R. D., Price, M. K., & Rundhamer, F.	2017	Do the effects of social nudges persist? Theory and evidence from 38 natural field experiments	Multiple samples	Field Study	meta-analysis	Environment - Energy efficiency	Social comparison - periodic mailers comparing a household's energy use to that of similar neighbours.	Although we do not invalidate or rule out behavioural adjustments, our findings suggest a previously understated role of capital investments in response to social nudges. Earlier research on habit formation presents a pessimistic perspective on the ability of social policies and programs to induce persistent changes in habits. Our study does little to overturn this view.
17	Brown, Johnstone, Hascic, Vong & Barascud	2013	Testing the Effect of defaults on the thermostat settings of OECD employees.	France	Field Study	RCT	Environment - Energy efficiency	Default Setting on Thermostat - baseline 20 degrees [max adjustment 3 degrees], treatment 1 - down to 17 degrees, treatment 2 - down to 19 degrees	The direct policy message from this small experiment is limited in scope, but clear: Small reductions in the defaults of office thermostats can lead to lower temperature settings by occupants in the winter heating season, which when scaled up to the whole building should translate into lower energy use. However, if the reduction in default temperature is too large, then occupants respond actively, increase their temperature settings, over-riding the effects of the change in the default setting. In quantitative terms, our results indicate that a reduction of the default temperature from 20°C to 19°C would decrease energy use, but a reduction to 17°C would have no effect.
18	Bruns & Perino	2019	Point at, nudge, or push private provisions to a public good? Field experimental evidence for experts, politicians, and nobodies	Germany	Online Study	RCT	Environment - donation to climate change protection	Baseline [free to choose], vs Nudge 1 recommended of a fixed amount to contribute, Nudge 2 - default pre chosen selection of a fixed amount, Nudge 3 restriction on contributions between two fixed amounts	
19	Byrne, D. P., Nauze, A. L., & Martin, L. A.	2018	Tell me something I don't already know. Informedness and the impact of information programs.	Australia	Laboratory Study	RCT	Environment - Energy efficiency	Information provision + social norm; Baseline (not sent information via email), bi-weekly emails and home energy reports (based on accurate information gathered from pre-treatment study to determine energy usage of panel)	First, before seeing their smart-meter data, households do not systematically underestimate their relative electricity use. Rather, most households believe they are "average" energy users, with high and low users underestimating and overestimating their relative levels of energy use at symmetric rates. We find that errors-in-beliefs regarding relative use can generate unintended consequences: namely, increases in use by under estimators, which is a type of boomerang effect. we find a second and larger boomerang effect from our information treatment that is unrelated to errors-in-beliefs. Controlling for beliefs, low-use households persistently increase energy use in response to treatment.
20	Castro & Scartascini	2013	Tax Compliance and Enforcement in the Pampas: Evidence from a Field Experiment	Argentina	Field Study	Stratified bloc randomization - RCT	Tax compliance	Framing (incl. social comparison) - Deterrence message [cost of noncompliance], Fairness message [use of revenues from tax collection], Equity message [3/10 eligible taxpayers did not pay their tax liabilities]	In particular, those who complied in the past tended to react negatively to information about other people's compliance levels. Need to segment the population because average of responses masks the fact that there are backfiring effects because of the heterogeneity of the population (e.g. by wealth, views on public services, property ownership, prior history of non-compliance).

When interventions fail

21	Chabe-Ferret, Coent, Reynaud, Subervie, & Lepercq	2019	Can we nudge farmers into saving water? Evidence from a randomized experiment	France	Field study	RCT	Environment - Water conservation	via -text: baseline - [generic details of need to conserve water]; Social comparison [presentation of actual consumption - with average consumption of other famers	Three main results emerge. First, the number of farmers consuming no water is higher in the control group. Second, the number of farmers whose consumption exceeds 80 per cent of the quota is smaller in the treatment group. Third (and consequently), the number of farmers consuming some water but less than 80 per cent of their quota is larger in the treatment group. This suggests that the social comparison nudge prompted some farmers who would not have consumed water to start consuming and also changed the behaviour of high consumers, discouraging them from consuming more than 80 per cent their quota
21	Chabe-Ferret, Coent, Reynaud, Subervie, & Lepercq	2019	Can we nudge farmers into saving water? Evidence from a randomized experiment	France	Field study	RCT	Environment - Water conservation	via -text: baseline - [generic details of need to conserve water]; Social comparison [average consumption of other famers	Experiment 2 doesn't show the same backfire effects - but limited effect of the nudge
22	Chiou, W. B., Yang, C. C., & Wan, C. S	2011	Ironic effects of dietary supplementation: illusory invulnerability created by taking dietary supplements licenses health-risk behaviors	Taiwan	Quasi-Field Study	RCT	Consumption habit - healthy eating	They were asked to take either a pill that they were told was a multivitamin (vitamin-pill group) or a pill that they were told was a placebo (control group but, all received placebo pills. In E1, choice of healthy meals was a measure of behavioural impact of the supplemented, and in E2 number of steps taken was the measure of behavioural impact. Framing (incl. social comparison) - treatment group - social comparison of energy usage + tips on how to conserve energy. Graded feedback by performance [great, good, room for improvement]. Option to later opt-out of the treatment	In E1, the results suggest that use of dietary supplements may increase perceived invulnerability, and thereby license subsequent self-indulgent health-related behaviours leading to reduced health choices. E2 mirrored the effects of E1, such that belief in taking the "active" supplements involving demonstrated the same type of licensing effect of dietary-supplement use and the mediating role of perceived invulnerability. Ironically, participants who were given purported dietary supplements walked less than participants who were not, even after being explicitly reminded about the health benefits of walking.
23	Costa & Kahn	2013	Energy conservation "nudges" and environmental ideology: Evidence from a randomized residential electricity field experiment	USA	Field Study	RCT	Environmental - Energy savings	Framing (incl. social comparison) - treatment group - social comparison of energy usage + tips on how to conserve energy. Graded feedback by performance [great, good, room for improvement]. Option to later opt-out of the treatment	evidence of backfiring comes from the % of respondents to the treatment group opt-ing/optiming-out - Households that opted out of the treatment were more likely to be high electricity consumers, both relative to their neighbours and in absolute levels, and they were less likely to be liberals than conservatives (see Table 6). At the mean opt out rate of 0.020, a liberal was 15% less likely to opt out. High electricity users relative to their neighbours were 65% more likely to opt out. The indication here is that segmentation is critical, because political ideology, including prior usage of energy, as well as levels of pro-environmental behaviours is predictive of responses to interventions
24	Damgaard & Nielsen	2016	The hidden cost of nudging: Experimental evidence from reminders in fundraising	Denmark	Field Study 1	RCT	Charity Donations	Framing - Baseline [solicitation email detailing causes and that those who donate within 10 days will donate additional money], Treatment 1 - Targeted Reminder [Control + email reminder in 7 days to those who haven't donated, or unsubscribed]	While there is % increase in donations in the treatment group relative to baseline, also there is a significant % of unsubscribers in treatment group relative to baseline
24	Damgaard & Nielsen	2016	The hidden cost of nudging: Experimental evidence from reminders in fundraising	Denmark	Field Study 2	RCT	Charity Donations	Framing - Baseline [solicitation email detailing causes, Treatment 1 - Future benefit [details about announcements about donating meals to poor children], Treatment 2 - Low frequency [infrequent announcements via email]	No difference between % donations between conditions, but significant lower % of unsubscribers in treatment group relative to baseline

When interventions fail

25	Damgaard, M. T., & Gravert, C	2016	The hidden costs of nudging: Experimental evidence from reminders in fundraising	Denmark	Field Study	RCT	Charity Donations	Messaging strategies (emailing) reminding participants to contribute and what their contributions would help in.	We find reminders increasing intended behaviour (donations), but also increasing avoidance behaviour (unsubscriptions from the mailing list).
26	Daniels, D & Zlatev, D.	2019	Choice architects reveal a bias toward positivity and certainty	US	Laboratory Study	RCT	Medical/ financial/ business/law	Framing effect - loss/ gains - as a strategy that choice architects use to frame their interventions - in a framing task	Across the 4 Experiments the distortions in the choice if intervention that "hypothetical choice architects (where participants assume the role of choice architects) appear to primarily reflect decision biases rather than social preferences, and in some cases, they caused a majority of people to use an influence "nudge" strategy that backfired.
27	Debnam & Just	2017	Endogenous responses to paternalism: Examining psychological reactance in the lab and the field	USA	Field Study	RCT - temporal control	Health-reduction of sugar sweetened beverages	Graphics: Public policy campaigns [Policy announcement of changes to regulation - Restricting sales of soda], v.s. Dept of health advertising campaign - attention to health and consequences of overconsumption of sugar sweetened beverages	Consistent with reactance, we find that following the initial announcement of Mayor Bloomberg's intent to place restrictions on the quantity of SSBs purchased in New York City retailers, resident households increased their weekly consumption of soda by 8.78 ounces on average. Further, we find that after the successful passage of the amendment to Article 81 limiting SSB purchases, households increased their consumption of soda by 11.94 ounces. We also find statistically significant evidence that, consistent with policymaker goals, following the Department of Health's "93 packs" advertising campaign which called attention to the health consequences of overconsuming SSBs, the average New York City household decreased their weekly soda consumption by 8.50 ounces.
27	Debnam & Just	2017	Endogenous responses to paternalism: Examining psychological reactance in the lab and the field	USA	Laboratory Study	RCT	Health-reduction of sugar sweetened beverages	Graphics [social comparison] - Posters of anti-soda vs. Control [details of lifestyle and questionnaires of level of activity]	Controlling for preference and socio-demographic variables, we find that anti-soda advertisements increase the level of soda consumed by participants in the lab by 2.11 ounces in a result unexplained by differences in participant enjoyment of the soda they consumed. This result is disproportionately driven by the behaviour of male participants who drink 2.68 ounces of additional soda under the treatment condition (though this result is not statistically significant when parsing the data this way)
28	Delmas, M. A., Fischlein, M., & Asensio, O. I.	2013	Information strategies and energy conservation behaviour. A meta-analysis of experimental studies from 1975 to 2012.	multi-national	Meta-analysis	meta-analysis	Environment - Energy efficiency	Multiple nudges - social norming, information provision, feedback, pecuniary strategies (i.e. financial savings)	For the pecuniary strategies (Model 4), we find 'Monetary Savings Information' or in other words, providing information about potential cost savings, to be significant predictors of energy use behaviour, although the effect is opposite to what is predicted by theory. Controlling for major study characteristics, monetary savings information alone did not induce conservation outcomes among study participants but in fact increased usage
29	Dimant, van Kleef, & Shalvi	2019	Requiem for a nudge: framing effects in nudging honesty	USA	Online Study	RCT	Moral behaviours	Framing + Social comparison:	Notably, our secondary results suggest that a substantial portion of individuals misremembered norm-nudges such that they conveniently supported deviant behaviour. This subset of participants indeed displayed significantly higher deviance levels, a behaviour pattern in line with literature on motivated misremembering and belief distortion.
30	do Vale, Pieters, & Zeelenberg	2008	Flying under the Radar: Perverse Package Size Effects on Consumption Self-Regulation	European	Laboratory Study [presentation of study 2]	RCT	Consumption habit - healthy eating	Package sizes of crisps	Consumers believe that smaller package formats help them to regulate hedonic, tempting consumption (study 1a). Especially when self-regulatory concerns are activated, they believe that large package formats of tempting products should be avoided (study 1b). Yet, using smaller package formats can actually backfire and cause such consumption to increase, whereas using larger package formats does not (study 2). That is, when self-regulatory concerns were activated, consumers deliberated the most before deciding to consume, were least likely to consume, and consumed the least of tempting products from large package formats
31	Fairchild, A. L.	2013	Half empty or half full? New York's soda rule in historical perspective	USA	Field Study	Observational	Campaign + scaling the size of beverages	Sizing of Packaging	The actual resizing of beverages containing unhealthy drinks lead to increases in the sales of unhealthy drinks, and a backlash from the the public in the New York region where the resizing was mandated there were further efforts to tax (or ban) high sugar content drinks.
32	Fan, Jiang, & Cui	2019	The backfire effect of default amounts on donation behaviour in online donation platform.	China	Laboratory Study	RCT	Charity Donations	Defaults on amounts donated on an online platform	In line with our predictions, high default amounts (vs. low default amounts) led to lower donation intention and lower donation amounts, driven by perceived inference of manipulation. This effect was robust by using both student and non-student samples, different call-for-donation messages, and different default amounts. Our results also revealed the significant moderating role of moral identity. The default amount effect was only significant when individuals were primed with low moral identity (vs. high moral identity).
33	Feldhaus,	2018	Reminders for	Germany	Field	RCT	Contributions	Labelling reminders	Indeed, the payment probability is higher in presence of a neutral

When interventions fail

	Sobotta, & Werner		voluntary payments might backfire-evidence from a field study		Study		to public services [use of rest rooms]		reminder compared to no reminder which is in line with the literature on charitable giving (Huck and Rasul, 2010; Damgaard and Gravert, 2018). Yet, there is no evidence that this effect can be amplified by an extended message. In fact, descriptively, payment probabilities are even lower in both extended reminder treatments.
33	Feldhaus, Sobotta, & Werner	2018	Reminders for voluntary payments might backfire-evidence from a field study	Germany	Field Study	RCT	Contributions to public services [use of rest rooms]	Labelling reminders	The results are in line with the non-parametric tests. First, the neutral reminder results in a higher payment probability compared to no reminder (the "Simple Reminder"-coefficient is positive and significant). Second, we observe no evidence that the payment probability can be further increased by extended messages. Third, our results suggest that the construction works treatment and the blood donation treatment decrease the payment probability relative to the neutral reminder.
34	Fonseca & Grimshaw	2017	Do behavioural nudges in pre-populated tax forms affect compliance? Experimental evidence with real taxpayer	U.K.	Quazi Field study	RCT	Tax compliance	Defaults - pre-populated forms on tax form; baseline - no filled in information on form, Correct self-employment pre-populated, Over self-employment pre-populated, Under self-employment pre-populated, Under generic [incorrect low] - click to edit details, Under Always [incorrect low] + additional information + click to confirm, Under trigger [incorrect low] [same message as under always + display if income less than 40k]	A minority of people passively accept incorrect defaults; their compliance behaviour is primarily a function of the prepopulated value. However, most under-compliance is driven by active choice.
35	Furth-Matzkin & Sunstein	2017	Social influences on policy preferences: Confirmity and reactance	USA	Online Study [reporting study 1 results, 3 studies in total]	quazi attitudinal study - comparison for two conditions	General social policy issues (e.g. anti-abortion, changing last name after marriage, green energy, retirement savings, gender reassignment)	Social comparison - Majority support for interventions in the social policy domains, Minority support for interventions in the social policy domains,	while conservatives and liberals responded in line with non-conformity when it came to anti-abortion, but the moderate participants seemed to exhibit reactance: while 38% of moderates were supportive of the anti-abortion policy when informed that most Americans opposed it, the level of support for this policy was marginally significantly smaller (23%) when subjects were informed that most Americans supported it.
36	Garnett, E. E., Balmford, A., Sandbrook, C., Pilling, M. A., & Marteau, T. M.	2019	Impact of increasing vegetarian availability on meal selection and sales in cafeterias	U.K.	Field Study	Observational	Healthy eating/sustainable consumption	Examining the variability in the total number of vegetarian meal options in a college cafeteria	Increasing vegetarian availability had little effect on total sales or vegetarian sales at other mealtimes not involved in experiments, indicating rebound effects were probably small or non-existent. In 2 of 3 cafeterias, increasing vegetarian availability did not lead different responses, in terms of number of meals bought, by diners with different prior levels of vegetarian meal selection. In the third college, there was a modest difference (with those previously eating meat responding slightly negatively to increasing vegetarian meal availability); however, together, these results suggest that increasing vegetarian availability did not substantially put off meat eater.
37	Goswami & Urminsky	2016	When should the ask be a nudge? The effect of default amounts on charitable donations	USA	Laboratory Study	RCT	Charity Donations	Defaults on amounts donated on an online platform	Generally findings across 7 online studies, the low default resulted in a scale-back effect, in which those who chose to donate reduced their donations, relative to donors in the high default condition. Second, defaults also resulted in a lower-bar effect, in which more people donated when shown lower defaults than for higher defaults.
37	Goswami & Urminsky	2016	When should the ask be a nudge? The effect of default amounts on charitable donations	USA	Field Study	RCT	Charity Donations	Letters and a pledge card (pledge cards showed the number of years of giving by donor) to potential donors & prior donors: three options, low option, medium option, high option, reminders vs. no reminders, number of options for donations 2 vs. 5	Relative to control, donation rates for low, medium and high defaults increased, but average donation was lower compared to control for all three default options - the pattern of results match up with the online studies where defaults have interactive effects on the donor depending on the various options connected to the defaults
38	Hagman, Erlandsson	2019	The effect of paternalistic	Sweden	Online Study	RCT - Attitudinal	General social policy issues	Range of nudges vs. legislative	we find that when the alternative to the nudge is legislation, acceptance decreases and perceived intrusiveness increases (relative to

When interventions fail

			alternatives on attitudes towards default nudges		[study 1, study 2]		(e.g. organ donation, green nudge, retirement savings, cancer screening)	alternatives	conditions where the alternative is no regulation)
39	Hagmann, Ho, & Loewenstein	2019	Nudging out support for a carbon tax	USA	Online Studys [exps. 4]	RCT - Attitududinal	General social policies - focusing on carbon tax in relation to green nudges and default retirement savings schemes	carbon tax, carbon tax + green nudge, or paired with default retirement savings nudge	Across six studies, support for a carbon tax declines when a green energy nudge is introduced, confirmed by an internal meta-analysis of the environmental studies (random effects; $d+ = 0.30$, 95% CI = (0.22, 0.37), $z = 7.89$, $P < 0.001$, $Q(6) = 13.65$, $P = 0.03$, $I^2 = 48.25\%$). We find no consistent heterogeneous treatment effects that would suggest that such crowding-out is more pronounced for those more opposed to government intervention, less certain that climate change is occurring or who believe the nudge is more effective than the other policy
40	Hainmueller, J., Hixson, M. J., & Sequeira, S	2015	Consumer demand for fair trade: Evidence from a multistore field experiment	USA	Field Study	RCT	Ethical consumption	Labelling of food items to make salient ethical sourcing practices of the item.	We find that sales of the two most popular coffees rose by almost 10% when they carried a Fair Trade label as compared to a generic placebo label. Demand for the higher-priced coffee remained steady when its price was raised by 8%, but demand for the lower-priced coffee was elastic: a 9% price increase led to a 30% decline in sales. While consumers attach value to ethical sourcing, there is significant heterogeneity in willingness to pay for it
41	Handel	2013	Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts	USA	Field Study	AB design [comparison by before and after]	Health care plan	baseline vs. mandated switch to choose between 5 new menu options [with no default], but prior to and after this forced policy, employees could go back to a defaulted option - as a means of studying sought inertia	We use these estimates to study the impact of policies that nudge consumers toward better decisions by reducing inertia. When aggregated, these improved individual-level choices substantially exacerbate adverse selection in our setting, leading to an overall reduction in welfare that doubles the existing welfare loss from adverse selection
42	Heinze & Wüstenhagen	2012	Dynamic adjustment of eco-labelling schemes and consumer choice - the revision of the eu energy label as a missed opportunity	German	Online Study	Comparison of the two labelling options	Environment Energy consumption	Labelling of energy efficiency of products, A-G scale vs. A-plus scales [A to D, where A has 3 options +, ++, +++	The fact that the effectiveness of the European energy label decreases with the introduction of new categories beyond A illustrates that labels and brands, which intend to reduce complexity for consumers, operate under narrow constraints.
43	Hermstrüwer & Dickert	2017	Sharing is daring: An experiment on consent, chilling effects and a salient privacy nudge	German	Online Study	RCT	Protection of private data	default options - non-automatic deletion, automatic deletion vs. prior consent, consent after the fact	Our study hints at a regulatory dilemma, which arises from the fact that current privacy laws are designed to steer consent choices through salient information and notice: instead of empowering people to make a free and informed choice over consent, salient information and consent options may push people into conformity
44	Hunter, R. F., Tully, M. A., Davis, M., Stevenson, M., & Kee, F	2013	Physical activity loyalty cards for behavior change: a quasi-experimental study	U.K.	Quasi-field Study	RCT	Increasing exercise	Loyalty scheme used to gain points (translating into money) to incentives physical activity	No significant differences between Incentive group and Non-incentive group were found for primary or secondary outcomes at the 12-week and 6-month assessments if anything there appeared to be a backfire, where participants in the Incentive Group completed a mean of 22.49 minutes/week (95% CI=-2.58, 47.55) workplace physical activity compared to a mean of 35.02 minutes/week (95% CI=10.64, 59.41) in the Non-Incentive Group ($p=0.48$).
45	John & Blume	2018	How best to nudge taxpayers? The impact of message simplification and descriptive social norms on payment rates in a central London local authority	U.K.	Field Study 2 (Two field studies were conducted in total)	RCT	Council Tax bill payments	Social Norms - simple version baseline [details of tax], social norm treatment 95% of residents pay their council tax, social norm + baseline information	Field test 1 showed no significant impact of the social norm messaging on compliance, whereas Field test 2 shows backfire effects, where social norm lead to less compliance (41.40% paid in full) than the baseline (43.57%).
46	Kroll, T., & Stieglitz, S	2019	Digital nudging and privacy:	Germany	Online Study	multiple variants of	Increasing personal data	Messaging - variations in	almost half of the survey participants had not yet noticed either of the two privacy-related nudges presented in the online survey. Although it

When interventions fail

			improving decisions about self-disclosure in social networks			interventions	protection on social media	messaging and reminds of data privacy options	is difficult to ascertain for whom Facebook displays them, it might also be the case that the participants simply did not care about the notification when it was displayed, and hence forgot about it.
47	Kubicek & Cimander	2012	Does Feedback Information Reduce CO2 Emissions of Private Households? An Empirical Test of Behavioural Economics' Claims	Germany, Austria, & Spain	Field Study	RCT	Environment - Energy efficiency	Range of nudges, feedback on usage, emicons, social comparison	Between 30 and 50% of the panellists showed increased electricity consumption, although compared to the whole population of the respective city or region they can be classified as highly engaged people. Feedback information alone is not an enabling factor, even when emoticons are used and has limited sustainable effects given the high drop-out rate over the two years. Even highly concerned people lose interest over time.
48	Liu, C., Gao, G., Agarwal, R	2016	The dark side of positive social influence	Taiwan	Field Study	RCT	Health related activities - physical exercise	Social norming - by setting goals relative to comparison groups	We studied the effect of social norms on users' goal setting and goal achievement behaviour. While social influence increases the rate of goal setting, strikingly, we also observe a dark side to social influence in that such influence yields lower rates of goal achievement
49	Margetts & Kasima	2017	Spillover between pro-environmental behaviours: The role of resources and perceived similarity	Australia	Laboratory study	RCT	Environmental-sustainable consumption; Charitable giving	Provision of information via priming, Restructuring choices	The key findings show that while there were significant main effects, an analysis of simple main effects showed that there was a positive spillover effect (to the charitable domain) in the no prime condition. When participants performed pro-environmental behaviours (green shopping), they contributed to the pro-environmental charitable cause more than when they did not (conventional shopping). However, when the pro-environmental goal was primed, there was no effect of prior pro-environmental behaviours (i.e., no effect of the critical priming interventions).
50	Mazar & Zhong	2010	Do green products make us better people?	Canada	Online Study 2 (three Studys in total)	RCT	Environmental - consumer choices	Priming through distribution of green to non-green products on sale	Green products embody social considerations, so that mere exposure to them increases subsequent prosocial behaviour. However, acting upon one's values establishes moral credentials that can subsequently license deviating behaviour. Given the growth of the green-product market and the interconnectedness of people's everyday behaviour, it is important to determine the limits of such a licensing effect. Experiment 2 showed a decrease in altruistic behaviour, which can be undesirable from a welfare perspective, but is not necessarily immoral. Next, we tested whether purchasing green products can establish enough moral capital to encourage clear transgressions, such as lying and stealing.
51	Murray & Matland	2015	You've gone too far: Social Pressure Mobilization, Reactance, and individual differences	USA	Laboratory Study	Attitudinal + hypothetical choice RCT - plus design 2 (high v.s low social pressure) x 2 (democrat vs. republican candidate)	Civic duty - voter turn out	Social comparison - Majority support for interventions in the social policy domains - indicated by times voted or not across years, Minority support for interventions in the social policy domains indicated by times voted or not across years	The results indicate that reactance effects are fairly broad and most of the results find limited differences across subsamples, although there is a need to be cautious because of limited statistical power. There were however, general reactance effects to social pressure mechanisms
52	Paryavi, Bohnet, & van Geen	2019	Descriptive norms and gender diversity: reactance from men	USA	Laboratory Study	RCT	Employment - fairness in hiring	Social norms - Control maths/verbal, counter norm - % (high/low) women than men math (and equivalent verbal), affirming norm - % (high/low) men than women math (and equivalent verbal)	When no social norm information was presented, then choices were not in line with stereotyping. When counter norm information was presented, men overcorrected in line with stereotyping, and were in line with norm affirmation, women generally responded outside of stereotyping regardless of social norm information

When interventions fail

53	Peth, Musshoff, Funke, & Hirschauer	2018	Nudging farmers to comply with water protection rules - experimental evidence from Germany	Germany	Laboratory Study	RCT	Compliance with water regulations	Baseline- Details of consequences of non-compliance, Nudge 1 - information + pictures, Nudge 2 - pictures with details of social comparison indicating compliance of neighbouring fields	In the deviant subpopulation, we find that nudge A slightly decreases non-compliance (-5.6 %). Surprisingly, nudge B even increases non-compliance (+8.6 %).
54	Pham, N., Mandel, N., & Morales, A. C	2016	Messages from the food police: how food-related warnings backfire among dieters	USA	Laboratory Study	RCT	Health - dietary support	Dietary messaging - one-sided positive vs. one-sided negative vs. neutral	Across three studies, we demonstrate that dieters (but not nondieters) who see a one-sided message focusing on the negative aspects of unhealthy food (vs. a one-sided positive or neutral message) increase their desire for and consumption of unhealthy foods. In contrast, dieters who see a two-sided message (focusing on both the negative and positive aspects of unhealthy food) are more likely to comply with the message, thereby choosing fewer unhealthy foods. Our research suggests that negatively worded food warnings (such as public service announcements) are unlikely to work—nondieters ignore them, and dieters do the opposite.
55	Richter, Thøgersen & Klöckner	2018	A Social Norms Intervention Going Wrong: Boomerang Effects from Descriptive Norms Information	Norway, Germany	Field & Laboratory Study	RCT	Environment - sustainable consumption	labelling via Social norming - seafood label: sign 1 - prompt/injunctive norm, signs 2-8 also included text referring to the group size, type and buying behaviour (4%, 11%, 28%, 52%, 69%, 82%, 91% - of all customers buying seafood yesterday chose MSc/ASC) - sustainably sourced fish	In order to simplify, and because the detailed analysis revealed no differences between different descriptive norms conditions, a new multilevel analysis was done with only five groups (before, prompt, low social norms, high social norms, after). Again, a significant main effect for country was found. This analysis revealed a significant increase of labelled seafood sales in the prompt-only condition in Norway and a significant decrease of labelled seafood sales in the low reference group descriptive norm condition in Germany. A marginally significant decrease was found in the high reference group descriptive norm condition in Germany as well. Also, The expected negative effect of a <50% reference group (hypothesis H3) was confirmed in both countries compared with the prompt-only condition and also in Germany compared with the baseline. However, irrespective of the size of the reference group, the descriptive norms interventions produced a boomerang effect in this case.
56	Schultz, Nolan, Cialdini, Goldstein, & Griskevicius	2007	The constructive, destructive, and reconstructive power of social norms	USA	Field Study	RCT	Environment - Energy efficiency	Social comparison - descriptive norm - handwritten information about how much energy had been used, descriptive norm - average household consumption of the neighbourhood, information provision - how to conserve energy	But both effects are relatively small and have high associated p-values (0.427 and 0.271, respectively). The evidence thus remains inconclusive, and the question of whether different nudges reduce the severity of non-compliance (hypotheses 1b and 2b) must be left to further studies.
57	Smed, S., Scarborough, P., Rayner, M., & Jensen, J. D.	2016	The effects of the Danish saturated fat tax on food and nutrient intake and modelled health outcomes: an econometric and comparative risk assessment evaluation.	Denmark	Field study data & Economic analysis	Observational	Health - dietary support	Nutritional labelling, campaigning & fat tax	Some positive effects were found, decreases in the consumption of total fat was seen for almost all age groups ranging from 4.9% for middle-aged females to a decrease between 1.6% for older males and 4.4% for younger males (on average fat consumption decreased by 4.0%). Vegetable consumption increased by 7.9% on average and fibre consumption increased by 3.7%. However, substitutions as a result of the tax also produced some undesired consequences. Crucially, salt consumption increased for all age groups, except younger females, and fruit consumption decreased for younger men and women and for older women
58	Thunstrom, Gilbert, & Ritten	2018	Nudges that hurt those already hurting - distributional and unintended effects of salience nudges	USA	Online Study	RCT	Personal finances - consumer spending reduction	baseline - no nudge, salience nudge - "opportunity cost reminder" vs. "spending booster"	We find that the opportunity cost reminder nudge entirely fails to impact spending by those who would benefit from reducing their spending (spendthrifts), while it significantly reduces spending by those who already spend too little (tightwads). Hence, the overall impact of the opportunity cost reminder nudge is a likely reduction in consumer welfare. We find, however, that this spending booster nudge acts similar to the opportunity cost reminder –it negatively affects spending by tightwads, while having no impact on spending on the other groups. It therefore seems the spending booster nudge primarily made salient the pain associated with spending for tightwads and not, as intended, the benefits from spending
59	Tiefenbeck, V., Staake, T., Roth, K., & Sachs, O.	2013	For better or for worse? Empirical evidence of moral licensing in a behavioral energy conservation campaign	USA	Field Study	RCT Quasi-Experimental	Home Water and Energy consumption	Personalised feedback on consumption, and provision of information for effective changes in water/energy consumption, and Social Comparisons	We investigated the side effects of a water conservation campaign on residents' electricity consumption and found evidence that people exposed to the water campaign did reduce their water consumption as expected. Yet at the same time, they increased their electricity consumption relative to the control group
60	Torgler	2013	A Field Experiment in Moral Suasion	Swiss	Field Study	RCT	Tax compliance	baseline vs. letter (moral-suasion) indicating the value	Results for the underreporting of wealth return a very similar picture. The treatment group demonstrates higher values of noncompliance (M = 3,072 CHF) than the control group (M = -12,431 CHF), a difference

When interventions fail

			and Tax Compliance Focusing on Under declaration and Over-deduction					of paying taxes to the community	that borders on statistical significance (Prob> 'z' =0.102).
61	Van Kleef, E., Otten, K., & van Trijp, H. C	2012	Healthy Snacks at the checkout counter: A lab and field study on the impact of shelf arrangement and assortment structure on consumer choices	Netherlands	Laboratory & Field Study	RCT - laboratory study	Health - calorific consumption	Arrangement of healthy and unhealthy items on shelves	The lab study showed a higher probability of healthy snack choice when 75% of the assortment consisted of healthy snacks compared to conditions with 25% healthy snack assortments, even though choices were not rated less satisfying or more restrictive. But no difference in the consumption of unhealthy snack choices.
62	Vandenbroele, J., Slabbinck, H., Van Kerckhove, A., & Vermeir, I	2019	Mock meat in the butchery: Nudging consumers toward meat substitutes	Western European sample	Laboratory & Field Study	RCT	Health/ Environment - meat substitutions	Arrangement of meat substitutes relative to actual meat	Manipulations include increase the meat substitutes' visibility and (2) offer them in pairs with their meat-based counterparts. Doing so enhances sales of meat substitutes, relative to both past sales in the experimental store and sales in eight other control stores that serve as benchmarks. No backfire effect was observed as meat product sales did not increase significantly. A follow-up study disentangles the effect of product visibility and pairwise presentation. Both product visibility and pairwise presentation increase sales of meat substitutes. However, when visibility is high, fewer meat substitutes were sold in a pairwise presentation.
63	Wechsler, Toben, Lee, Seibring, Lewis, & Keeling	2003	Perception and Reality: A National Evaluation of Social Norms Marketing Interventions to Reduce College Students' Heavy Alcohol Use	USA	Field Study	RCT	Health - Alcohol consumption	Usage of Social norm campaign in schools - % of high risk drinkers or other such details through posters, handouts, signs, reading announcements, articles in school newspapers	Trend analyses at social norms marketing program schools revealed no significant decrease on any of the seven alcohol consumption measures. This applied to all social norms marketing program colleges, those with high-exposure and those with program durations of 2 years or more. On two of the outcome measures, we observed a pattern of significant increases in drinking at the social norms marketing program schools. The percentage of students who drank alcohol in the past month increased in the social norms marketing group and in the high and low exposure and the long and short duration subgroups. Moreover, the percentage of students consuming 20 or more drinks increased in all social norms marketing program schools, as well as in all subgroups of these colleges. On these two measures, all ten comparisons we conducted increased significantly.
64	Wisdom, J., Downs, J. S., & Loewenstein, G	2010	Promoting healthy choices: Information versus convenience	USA	Field Study	RCT	Health - calorific consumption	Messaging - food menu informational content & Arrangement of food options on the menu	We find that calorie information reduces calorie intake. Providing a daily calorie target does as well, but only for non-overweight individuals. Making healthy choices convenient reduces intake when the intervention is strong. However, a milder implementation reduces sandwich calories, but does not reduce total calories due to compensatory effects on side orders and drinks.

When interventions fail

65	Živčić-Ćosić, S., Bušić, M., Župan, Pelčić, G., Ivanovski, M., Rački, S	2013	Development of the Croatian model of organ donation and transplantation	Croatia	Field Study	Comparison of multiple interventions	Organ donation	Opt-out and other typical regulatory interventions.	The key factors that have contributed to the development of a "successful model for organ donation and transplantation" in Croatia in the past decade are the appointment of hospital and national transplant coordinators, the establishment of a 24 hour duty desk at the Ministry of Health and the implementation of a new financial model with donor hospital reimbursement. Public awareness campaign, intense international cooperation, accession to the Eurotransplant, adoption of new legislation, and implementation of a donor quality assurance program have also greatly contributed to the success of our program.
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General Findings

Overall what we can see is that there are some commonalities in the findings from the 65 studies that reported null effects, backfire effects, rebounds, boomerangs, and spill overs. Of the 65 studies compiled in Table 1 we can find that over half of the published work included field studies (58%), and most included an RCT (if field studies) or a baseline/control condition (75%). For those that did not include a control/baseline condition, the analyses were based on directly comparing two different types of interventions, were either observational, or else assessed the impact of the interventions trailed by comparing behavioural measures collected before and after the interventions were trialled.

If one looks at the types of social policy domains in which behavioural interventions were trialled, we can see that the most common domains are health (e.g. improving dietary habit, increasing exercise) (25% of the 65 published papers) and the environment (e.g. behaviours designed to encourage sustainable consumption, reducing energy consumption, reducing water consumption) (28% of the 65 published studies). The other domains that were second most popular were increasing charitable donations (13%) and increasing tax compliance (8%). It is hard to infer much from this, given that a systematic review was not conducted, and there is no baseline from which to compare the total number of published studies of trialled behavioural interventions in each of the critical domains (e.g. environment, health, personal finances, organ donation) to determine which generate the most failures against baseline, it is nonetheless interesting to see that many failures are reported in studies that attempt to generate positive behaviours in the domain of health and the environment.

If we look to the types of common interventions that are trialled, the first thing to highlight is that many studies trialled more than one intervention at a time, particularly field studies. This makes some practical sense, as it may be hard to control for the fact that many interventions appear in social policy domains for which an additional intervention that a researcher is trialling is likely to compete. Also, from a practitioner's point of view, there may be strong incentives (cost in time and money) that mean that more than one intervention will be trialled in the same study to maximise the possible effect of behavioural change. Thus, looking across the recorded studies that were reported in the 65 studies, we find that the most common type of behavioural intervention trialled is a form of social comparison or social norming (often the injunctive type) (40% of the 65 published studies). The provision of information or framing/salience were often delivered through letters/text messaging (24%). Then the next most common were the use of defaults (15%) and the use of labelling (12%). As with the context in which failed interventions have been reported, it is difficult to ascertain whether it is simply case that social comparisons and social norm are the most likely to generate failures, or that they are the most commonly used behavioural interventions, as so this increases the likelihood of failures being reported. To answer this, work is needed to compile an accurate data base of published trialled interventions (successful or otherwise) first, from which it is possible to determine which are most frequently used and where, to then determine which are most likely to succeed and fail relative to appropriate baselines.

Concluding section

The approach taken here has been to compile an evidence base that can be used to inform and advance theory and practice on behavioural change. The main aim here has been to use this collection of studies, and to build on them so that researchers and practitioners can develop a comprehensive record of behavioural interventions that fail, so as to learn from those failures and improve on them. There is just as much, if not more opportunity from learning from behavioural interventions that fail than those that generate reliable positive behavioural change. These insights

can be used to indicate where improvements can be made for designing interventions and to advance theorising in this area.

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