

foodpath

Review of Relevant Consumer Behaviour Change Studies and Initiatives

DELIVERABLE 1A

*Eileen Mitchell¹, Alberto Longo¹,
Sarah Broderick², Colum Gibson²,
Pauline McDonogh³*

¹ Queen's University, Belfast

² Clean Technology Centre, Munster Technological University

³ Southern Regional Waste Management Office

Food Path

Food Path is collaborative research project involving Queen's University Belfast, the Regional Waste Management Offices and led by the Clean Technology Centre, Munster Technological University.

This project is funded under the EPA Research Programme 2014-2020. The EPA Research Programme is a Government of Ireland initiative funded by the Department of the Environment, Climate and Communications. It is administered by the Environmental Protection Agency, which has the statutory function of co-ordinating and promoting environmental research.

Food Path aims to identify existing best practice in consumer behaviour change and food waste prevention, and to apply this through intervention trials in Irish communities. This work will inform Ireland's response to food waste prevention and the achievement of UN Sustainable Development Goal: Target 12.3.

Context of Report

This report is one of two outputs for Food Path Workpackage 1. It provides an overview of a wide range of behaviour change policies and interventions that are relevant to food waste prevention. A more targeted review of food waste prevention best practices and interventions is provided in the accompanying report: Review of Best Practice for Interventions to Reduce Consumer Food Waste.

These dual reports have been published to combine knowledge from the well-established areas of research such as health promotion, diet, climate action and energy conservation, with that from the developing discipline of food waste prevention.

This report, led by Queen's University Belfast, aims to examine the parallels between behaviour change interventions in food waste prevention and other domains such as the health promotion and the wider environmental action. This finding from this work will be combined with those from the food waste focused review to inform future food waste prevention activities in Ireland, in particular the upcoming Food Path intervention design.

DISCLAIMER

Although every effort has been made to ensure the accuracy of the material contained in this publication, complete accuracy cannot be guaranteed. The Environmental Protection Agency, the author(s) and the steering committee members do not accept any responsibility whatsoever for loss or damage occasioned, or claimed to have been occasioned, in part or in full, as a consequence of any person acting, or refraining from acting, as a result of a matter contained in this publication. All or part of this publication may be reproduced without further permission, provided the source is acknowledged.

This report is based on research carried out/data from April 2020 to January 2021. More recent data may have become available since the research was completed.

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

Table of Contents

Table of Tables	5
1 Introduction	1
1.1 Background	1
1.2 Aims and objectives	2
1.3 Methods	3
1.4 Study selection	3
1.5 Categorisation of included studies.	4
2 Results	5
2.1 Economic Incentives	5
2.1.1 The Effectiveness of Economic Incentives	7
2.2 Information campaigns	10
2.2.1 The effectiveness of information campaigns	10
2.3 Social media	15
2.3.1 The effectiveness of social media	15
2.4 Regulations	17
2.4.1 The effectiveness of regulation	17
2.5 Nudges	20
2.5.1 The effectiveness of nudges	22
3 Next Steps and recommendations	24
4 References	28

Table of Tables

Table 1: Exclusion and inclusion criteria.....	3
Table 2: Examples of common tools used for behaviour change	4
Table 3: Summary description of economic incentives.....	6
Table 4: Examples of included financial incentive studies	9
Table 5: Examples in the literature of the effectiveness of mass media campaigns	12
Table 6: Examples of included public information studies.....	14
Table 7: Examples of social media studies	16
Table 8: Examples of regulations.....	18
Table 9: Overview of the three policy instruments for behaviour change	19
Table 10 – regulation vs nudge example.....	20
Table 11: nudge categories.....	21
Table 12: nudge intervention examples	22
Table 13: main research recommendations.....	25

1 Introduction

1.1 Background

Since 2007, tackling food waste has received much attention in Ireland and the UK and indeed around the world: governments, international agencies, businesses, local authorities, community groups, and NGOs as well as research academics from a range of inter-disciplinary fields have worked with consumers to change the way in which food is bought and used. Major retailers, food brands and other manufacturers have also contributed through innovations in products, packaging and labelling (Schanes, Dobernig, and Gözet 2018).

However, despite these initiatives governments around the world have begun to recognise that current policy intervention methods are not effective enough at reducing food waste.

There has been a long-standing debate on if, and how, behavioural interventions can reduce the contribution of household actions to food waste. Unfortunately, countries and municipalities have limited experience with applying behavioural interventions for reducing consumer food waste, and current policies are either underdeveloped or require significant improvement in many countries.

Changing consumer's behaviour patterns is seldom a straightforward process. There are several things to consider, for instance the nature of the behavioural change, is it a one-time event or a sustained change over a long period of time. Additionally, when making changes to behaviour lifestyles, people typically focus on the risks, costs or losses associated with adopting a new behaviour, such as financial costs (what will it cost me?), physical risks (is it safe/healthy?), social costs (what do others think?), ecological risks (is it environmentally friendly?), time costs (will it take longer?), functional risks (does it fit my routine?), and even psychological costs (how will I feel?), and tend to discount equivalent gains and benefits.

Evidence tells us that individuals may, at times, make decisions that are not in their best long-term interest and do not always behave rationally to maximize their well-being (Michie, Van Stralen, and West 2011). It is perhaps unsurprising, then, that traditional educational programmes and mass-media campaigns – which strive to promote practical food waste guidelines and attitudes by simply disseminating information – often fail to produce the desired behaviour change that is intended.

More research is therefore required to understand which type of behavioural interventions work best in mitigating food waste at the household level. The use of behavioural

interventions in the food waste sector are a relatively new concept, and has not been as well debated or established as other sectors such as healthcare or the environment. It is therefore worthwhile examining if parallels exist between using behaviour change interventions in food waste management and other domains such as the healthcare and the environment. For instance, in healthcare, behaviour change interventions have been successful at changing a number of different health outcomes, such as preventing and stopping people engaging in harmful or risky behaviours (e.g., smoking), encouraging protective health care intervention behaviours (sun cream protection), and promoting effective self-management of diseases (e.g. monitoring blood glucose concentrations) (Mantzari et al. 2015).

The purpose of this section will be to examine a range of behaviour interventions applied in the environment, energy and healthcare sector in order to determine if any similarities or differences exist, and to draw parallels and determine how best to use this evidence when implementing behaviour change policies in the food waste sector.

1.2 Aims and objectives

To tackle food waste, there needs to be a clear understanding of behaviour that leads to food wastage. The purpose of this review is to critically appraise current behaviour change initiatives and determine their effectiveness at reducing food waste levels.

The research objectives of this review are as follows:

1. To critically review academic studies and existing initiatives on consumer behaviour change applied to both a) the environment (e.g. reducing energy consumption or water consumption, changing modes of transport etc.), and b) other relevant areas (e.g. healthy eating, smoking cessation etc.) to provide guidance on the implementation of future Irish behaviour change interventions for food waste reduction.
2. To explore how cultural, socio-economic, geographical and other differences may affect the implementation of behavioural change interventions for food waste prevention.
3. To draft an initial review of behaviour-change-based food waste prevention interventions.

1.3 Methods

An initial scoping search for behavioural intervention studies published was conducted using the following electronic databases: Google scholar, Pubmed, Embase, EconLit, Web of science. The terms "behaviour change" or "intervention" and "environment" or "climate" or "health" or "energy" or "food" and "critical appraisal" or "systematic review" were used to search the Pubmed, Web of Science and Embase databases. The initial results revealed that there are around 300-400 potential intervention studies available on behavioural interventions. This pool of literature will be further developed through the snowballing technique i.e. by checking the references of the articles yielded by the initial search.

1.4 Study selection

The inclusion criteria presented in the table below were based on the requirements set out in the scoping document produced by the National Institute for Health and Clinical Excellence (NICE 2005)

Table 1: Exclusion and inclusion criteria

Inclusion	Exclusion
Reviews published in English Reviews reporting empirical data on the effectiveness of interventions designed to change knowledge, attitude, intention and behaviour with respect to smoking, physical activity, and health eating	Review of interventions which did not contain a behavioural/educational component to the intervention

1.5 Categorisation of included studies.

Studies included in this review were grouped into five different behaviour change categories, these included: economic incentives, informational campaigns, social media tools, regulation tools and finally the use of nudges as a mechanism for sustainable behaviour change. Table 1 provides a brief description of each of these categories.

Table 2: Examples of common tools used for behaviour change

Category	Description
Economic incentives	An incentive is anything that motivates a person to do something. When we are talking about economics, the definition becomes a bit narrower: Economic incentives are financial motivations for people to take certain actions.
Informational campaigns/Mass media	Public information campaigns are the traditional means of delivering information about services or driving awareness to a certain subject.
Social media tools	Social media is any digital tool that allows users to quickly create and share content with the public. Social media encompasses a wide range of websites and apps. Examples include Twitter, which specialise in sharing links and short written messages.
Regulation tools	Are explicit state interventions in policy, plan, project or programme (PPPP) processes, in pursuit of specific societal outcomes not achievable through normal market-based or incentive mechanisms.
Nudges	Nudge is a concept in behavioural economics, political theory, and behavioural sciences, which proposes positive reinforcement and indirect suggestions as ways to influence the behaviour and decision making of groups or individuals.

2 Results

2.1 Economic Incentives

Economic incentives can be defined as monetary or non-monetary rewards (e.g. vouchers and prizes) offered to individuals to encourage them to behave in a desired manner. Other examples of financial incentives include cash payments, lotteries, coupons for free or reduced-price goods and services, gifts, free or reduced price medical services, and the opportunity to avoid disincentives. Financial incentives can be positive through rewarding or reinforcing desired change, or negative by imposing penalties if change is not achieved (Rode, Gómez-Baggethun, and Krause 2015). A positive incentive rewards individual directly for a desired behaviour or outcome, (i.e. increasing their level of physical activity). Conversely, a negative incentive focuses on the failure of an individual to adopt a desired behaviour and discipline, by either withdrawing the reward or punishing / fining the individual for not achieving the desired behaviour, (i.e. not increasing their level of physical activity). Other types of economic incentives include 'commitment' contracts, whereby respondents deposit money into a scheme and only receive this money again if they achieve a desired goal or outcome. Table 3 provides a brief summary of some types of incentives used to change health behaviour.

Table 3: Summary description of economic incentives

Type of incentive	Description	Example from the literature
Positive incentive	Rewards individuals directly for a desired behaviour or outcome; they are affirmative enablers encouraging a desired behaviour	Offering a small cash payment, grocery coupon, or lottery ticket to reward attendance at antenatal or mental health clinics (Jochelson 2007)
Negative incentive	Negative economic incentives, or disincentives, punish people financially for taking certain actions. This is a way of encouraging specific actions without making them compulsory. Negative incentives focus on the failure of an individual to adopt a desired behaviour and disciplines the individual by withdrawing the reward, believing this will encourage adoption of the desired behaviour.	Smoking cessation scheme that withheld money from employees' pay checks if they tried but failed to cease smoking (Cahill, Hartmann-Boyce, and Perera 2015)
Behavioural deposit and Commitment contracts	Commitment contracts are contracts whereby people deposit money into an account and only receive the money back if they succeed in a certain goal. The purpose of commitment contracts is to encourage participants to continue adopting the desired behaviour.	Weight loss - participants deposit a lump sum for a course of treatment; they received back a payment if they met their goals, but forfeited it if they failed (Volpp et al. 2008).

2.1.1 The Effectiveness of Economic Incentives

Economic incentive schemes are increasingly being considered and applied in health policies around the world in an attempt to promote health-enhancing behaviours (Giles et al. 2014; Giles et al. 2016). The use of incentives to encourage uptake of healthy behaviours has been shown in several settings to be successful at modifying 'simple one-off behaviours' or infrequent health-related behaviours, such as visiting a clinic or medical screening as opposed to sustained behaviour change (Giles et al. 2014; Giles et al. 2016; Maher et al. 2014). For instance, eighty-six per cent of patients with depression attended appointments when offered US\$10 per appointment, compared to 69 per cent without the incentive (Jochelson 2007). Take-up of child immunisations increased from 6 to 23 per cent when parents were offered a lottery ticket to win a small cash reward, and take-up of flu immunisations increased from 20 to 29 per cent with an offer of a lottery ticket towards a \$50 grocery voucher (Achat, McIntyre, and Burgess 1999). Completion of a course of hepatitis vaccinations by homeless men increased from 23 to 69 per cent when they were offered \$20 a month for the six months of treatment (Seal et al. 2003). These examples show that one off payments or payments spread out over a number of weeks are effective at encouraging behaviour change.

Other positive financial incentives have been used to encourage people to change particular lifestyle behaviours, such as smoking, eating, exercise, sexual behaviour and drug use (Giles et al. 2014; Giles et al. 2016). These behaviours may be termed 'complex' as they are habitual and ingrained in the texture of people's lives; they are often reinforced by norms in an individual's social network and may also satisfy psychological needs particular to each individual. Consequently, these examples may be of particular relevance as food waste prevention is also complex and multifaceted.

Interestingly, incentives aimed at complex behaviours tend to be successful in short term in that they increased participation in lifestyle change programmes during the intervention. However, once an intervention ceased, participants tended to relapse into former behaviour patterns. For example, several systematic reviews of incentive-based smoking cessation programmes, based on a lottery style, offering participants a chance to win a large cash prize or luxury holiday, found that the incentive improved recruitment rates, and so delivered

higher absolute numbers of quitters, but that the initial high cessation rates declined and participants relapsed when the rewards were no longer on offer (Bryant et al. 2011; Mantzari et al. 2015). Similarly, financial incentives were found to increase attendance at supervised exercise sessions (Barte and Wendel-Vos 2017) but overall had little impact on long-term maintenance of weight loss or exercise levels. Small financial payments also increased attendance in a programme to reduce repeat teenage pregnancies from 9 to 58 per cent and from 37 to 55 per cent in a programme to reduce new diagnoses of sexually transmitted disease, but these did not lead to the desired long term health outcomes (Barte and Wendel-Vos 2017). Financial incentives were also found to improve the retention and abstinence of patients attending a drug cessation program (Giles et al. 2016). A summary of the results of some of these financial incentive studies is given in Table 4

Table 4: Examples of included financial incentive studies

Behaviour area	Example in the literature	Effectiveness of intervention
Physical activity (PA)	Financial incentives for physical activity in adults: systematic review and meta-analysis (Mitchell et al. 2020; Barte and Wendel-Vos 2017)	Modest incentives (\$1.40 US/day) increased PA for interventions of short and long durations and after incentives were removed
Physical activity	A Systematic Review of Financial Incentives for Physical Activity: The Effects on Physical Activity and Related Outcomes (Barte and Wendel-Vos 2017)	Some physical–activity–related financial incentives have positive, short-term effects, in particular the rewards. From a health perspective, it is recommended to aim incentives on total physical activity behaviour including duration and intensity. However, it should be kept in mind that the long-term effects of financial incentives are still not clear and that there is a need for more insight into the effectiveness of different types and components of financial incentives.
Alcohol abuse, drugs, smoking	Personal financial incentives for changing habitual health-related behaviours: A systematic review and meta-analysis (Mantzari et al. 2015)	Personal financial incentives can change habitual health-behaviours. However, the impact of financial incentives is not sustained long after incentive removal

2.2 Information campaigns

Public information campaigns (PICS) are one way that government officials deliberately attempt to shape public attitudes, values, or behaviour in the hope of reaching some desirable social outcome. In other words, they are a tool or instrument of government action (Weiss and Tschirhart 1994). These types of campaigns can directly or indirectly lead to health behaviour change in populations, but existing evidence varies depending on the type of behaviour being targeted (Young et al. 2018). Information campaigns have been used in a wide range of areas, most notably in tobacco use and heart-disease prevention, but have also addressed alcohol and illicit drug use, cancer screening and prevention, sex-related behaviours, child survival, and many other health-related issues (Wakefield, Loken, and Hornik 2010; Cavill and Bauman 2004). Compared to most other policy instruments, PICs are unusual in that they attempt to produce policy results without altering incentives or authority systems. Mass media informational campaigns are widely used to expose high proportions of large populations to messages through routine uses of existing media, such as television, radio, and newspapers (Wakefield, Loken, and Hornik 2010). Mass media campaigns can directly and indirectly produce positive changes or prevent negative changes in health-related behaviours across large populations (Durkin, Brennan, and Wakefield 2012; Wakefield, Loken, and Hornik 2010).

2.2.1 The effectiveness of information campaigns

There exists a wide range of evidence assessing the role of information campaigns effectiveness in a number of health domains such as tobacco use, alcohol and physical activity. A number of studies have assessed the effects of media campaigns on tobacco use and found strong evidence to suggest that these types of campaigns have been successful. Comprehensive reviews of controlled field experiments and population studies show that mass media campaigns were associated with a decline in young people starting smoking (White et al. 2003; Adams, Fasseur, and Geuens 2011) and with an increase in the number of adults stopping (Thompson, Barnett, and Pearce 2009; Kim, Cao, and Meczkowski 2018). Smoking prevention in young people seems to have been more likely when mass media

efforts were combined with programmes in schools, the community, or both (Kim, Cao, and Mieczkowski 2018). This is an important point to consider when implementing food waste mass media programs. However, a large majority of the evidence has been generated from studies in high-income countries because the highest number of campaigns have been done there and research capacity is substantial there (Wakefield, Loken, and Hornik 2010). Additionally, evidence also exists on the use of mass media campaigns to redress the disparities in smoking prevalence between subgroups with high and low socioeconomic status (Wakefield, Loken, and Hornik 2010). One cohort study has suggested that high exposure to anti-tobacco campaigns that elicit negative emotions, such as fear, disgust, and sadness, promotes increased cessation rates in lower socioeconomic populations (Kim, Cao, and Mieczkowski 2018). This finding is consistent with evidence in many population subgroups of the positive effects of anti-tobacco campaigns that use negatively emotive advertising messages. For example, media campaigns that graphically link smoking to serious health damage to motivate adult smoking cessation have also been associated with prevention of smoking uptake among young people (Kim, Cao, and Mieczkowski 2018; Wakefield, Loken, and Hornik 2010). Table 5 illustrates a few systematic review examples whereby information campaigns have been used to encourage behaviour change.

Table 5: Examples in the literature of the effectiveness of mass media campaigns

Behaviour area	Example in the literature	Effectiveness of intervention
Tobacco	To examine the effectiveness of tobacco control mass media campaigns: a systematic review (Atusingwize, Lewis, and Langley 2015)	Mass media programs were found to be effective, however more evidence is required on how to target specific audiences.
Alcohol	Effectiveness of mass media campaigns to reduce alcohol consumption and harm: a systematic review (Young et al. 2018)	Mass media campaigns can produce positive changes or prevent negative changes in health-related behaviours across large populations
Road safety	Effectiveness of mass media campaigns for reducing drinking and driving and alcohol-involved crashes: A systematic review (Elder et al. 2004)	Strong evidence for increased use of safety belts and decreased drink driving when mass-media campaigns were used. However, the study noted the evidence was mixed in other areas and more personalised target approaches may be required.
Climate change	Mass-media coverage, its influence on public awareness of climate-change issues, and implications for campaigns to reduce greenhouse gas emissions (Schmid-Petri et al. 2017)	The review found some strong evidence to indicate that mass campaigns work. However, noted that the success of these campaigns depends on policies that support climate change and investment in longer better-funded campaigns to achieve adequate population exposure to media messages.

In a systematic review of mass media campaigns to reduce alcohol consumption the authors reported that whilst mass media campaigns can, under certain conditions, reduce drink driving, there is limited evidence that they have reduced alcohol-related road accidents or related injuries and deaths (Young et al. 2018). Other systematic reviews found evidence to suggest that using mass media campaigns targeting college students are ineffective at preventing alcohol misuse (Foxcroft et al. 2015). Another systematic review examined the effectiveness of mass media campaigns for reducing alcohol-impaired driving (AID) and alcohol-related crashes. The results of this study (Elder et al. 2004) found that when mass media campaigns were generally effective. However, the effectiveness depended on a number of key areas: reaching the correct target audience, selecting the correct communication channel, making it attractive and credible. Table 6 details these guidelines and provides examples of when these types of policies did or did not work as intended

Table 6: Examples of included public information studies

Category	Description	Examples in the literature
Target Audience	The better the campaign designer specifies the target audience, the better tailored the campaign can be to that audience’s demands and interests.	Campaigns aimed to prevent drink driving might be aimed at drinkers but they might also be aimed at companions of drinkers (e.g., designated drivers or wives), party hosts or bartenders to get more leverage on the drinking driver (Tay 2005)
Selection of communication Channels	Once the audience has been defined, channels of communication are selected to reach that audience. Some channels are obviously poor candidates for reaching desired audiences	A campaign to address adolescent drug use used television ads that were broadcast only in the early morning hours, when few adolescents were watching (Allara et al. 2015)
Attracting Attention	Putting a message in front of an audience does not guarantee it will be seen or heard. All channels of mass communication are crowded. PIC messages compete for attention with entertainment, news, information, and commercial advertising, on newspapers, magazines, radio, TV, posters, or brochures (Kraak and Consavage Stanley 2021)	The introduction of a catchy slogan, “Be All That You Can Be,” and sophisticated production in the U.S. Army’s recruiting campaign in 1980, is credited with attracting the interest of better-educated potential army recruits. (Miller, Clinton, and Camey 2007)
Delivering a Credible Message	Campaigns should deliver messages that are clear, credible, and easy to understand.	Announcing the imminent eruption of a volcano and advising people to evacuate was not automatically or universally understood. People got the message that something was wrong, but many did not follow the instructions broadcast by the emergency agencies (Lavigne et al. 2008)

2.3 Social media

Social media can be defined as a group of online applications that allow for the creation and exchange of user-generated content, and which can be divided into five different types: (1) collaborative projects (e.g., Wikipedia), (2) blogs or microblogs (e.g., Twitter), (3) content communities (e.g., YouTube), (4) social networking sites (e.g., Facebook, snapchat) and (5) virtual gaming or social worlds (e.g., Minecraft). Social media is seen as a cost-effective way to increase user interaction, provide peer-to-peer support and widen access to health intervention

2.3.1 The effectiveness of social media

Previous studies have suggested that social media interaction can influence behaviour (Young et al. 2017). Social media may provide certain advantages for public health interventions because it is popular, it can reach a large and diverse audience and may be relatively less expensive to administer and maintain. However other studies have found mixed results (Williams et al. 2014). In a systematic review by Williams et al (2014) (Williams et al. 2014) the authors examined studies of social media interventions relating to healthy diet and exercise and found that despite its growing popularity, there is little evidence that social media interventions demonstrate a significant benefit for improving healthy diet and exercise. Another systematic review examined the uses of social media in public health and medicine (Giustini et al. 2018), and found that there was limited evidence to indicate the social media tools significantly influenced individuals health related choices and decisions. The evidence suggests that social media, as a tool/mechanism for behaviour change, may be effective but as these types of interventions are relatively new, more research is required. Table 7 outlines a number of studies which have examined the use of social media as a behaviour change tool.

Table 7: Examples of social media studies

Behaviour area	Description	Effectiveness of intervention
Health and medicine adherence	To examine the effective uses of social media (SM) in public health and medicine (Giustini et al. 2018)	A range of negatives and positives of SM in public health and medicine were found but overall more research was required
Physical activity trackers	To explore the effects of two communicative features of wearable fitness devices—social sharing and social competing—on individuals’ intention to exercise. (Zhu et al., 2017)	How exercise data is shared on social media significantly influences the exercise intentions, and these intentions are mediated by individuals’ evaluation of exercise, belief about important others’ approval of exercise, and perceived control upon exercise.
HIV testing	This systematic review examines the effectiveness of social media interventions to promote HIV testing, linkage, adherence, and retention among key populations (Cao et al. 2017)	Social media interventions are effective in promoting HIV testing among MSM in many settings. Social media interventions to improve HIV services beyond HIV testing in low- and middle-income countries and among other key populations need to be considered.
Diet and exercise	To examine the use of social media to promote healthy diet and exercise in the general population (Williams et al. 2014)	Social media may provide certain advantages for public health interventions; however, studies of social media interventions to date relating to healthy lifestyles tend to show low levels of participation and do not show significant differences between groups in key outcomes.
Organ donation	To investigate the effects of Social Media and Organ Donor Registration (Cameron et al. 2013)	Users who received the social media messages were 0.39% more likely to register than users who received the informational message or no message at all

2.4 Regulations

Regulation aims to set rules to protect and benefit people, businesses and the environment, stabilising markets and addressing market failures to support economic growth. Commonly used regulation tools include legislation, licenses, circulars, permits, regulations, registrations, administrative guidelines, directives and codes of practice.

2.4.1 The effectiveness of regulation

Regulations and laws have been useful at changing behaviour in a number of areas such as healthcare (Tompa et al. 2016; Ludolph and Schulz 2015), climate change (Vink, Dewulf, and Termeer 2013), energy conservation (Bowen and Panagiotopoulos 2020), including food waste (Schanes, Dobernig, and Gözet 2018). Many argue laws are sometimes effective because they are backed by the threat of punitive enforcement. This threat prompts individuals to make judgments about risk and reward before deciding whether to engage in a prohibited activity. Various laws and rules have changed human behaviour (or have attempted to) when it comes to their food choices, especially in the west as obesity rates grow and grow. In the UK, for example, it was reported at the end of 2018 that a trial that saw supermarkets remove sweets and crisps from checkouts resulted in almost a fifth less of the unhealthy products being sold. The researchers from British universities found that 17% fewer small packages of sugary confectionery, chocolate and crisps were bought and taken home from supermarkets after they introduced policies to limit unhealthy foods at tills (McPoland, Furey, and McLaughlin 2020; Ejlerskov et al. 2018). Table 8, highlights other examples where regulation and laws have been effective at changing consumer behaviour.

Table 8: Examples of regulations

Area	Evidence of effectiveness
Regulation – Tax on food high in salt, sugar or caffeine was introduced in Hungary in 2011	Quantities of processed food decreased by 3.4% due to the unhealthy food tax, (Bíró 2015)
Legislation – banning indoor smoking in workplaces in Spain	Reduction in smoking prevalence and second hand smoke exposure (Lidón-Moyano et al. 2017)
A code of practice – introducing codes of practice towards pro-environmental workplace behaviours	workplaces with stronger pro-environmental climates resulted in employees being more engaged in pro-environmental behaviours both at work and at home (Yuriev et al. 2018)

However, there are a number of disadvantages to using regulation methods to encourage behaviour change, the main barrier being that regulation can create huge government bureaucracy that stifles growth and squashes innovation by over-regulating. Another issue with regulation is that it assumes that individuals would behave in a rational manner. Traditionally, public health scholars used the ‘carrot’, the ‘stick’ and the ‘sermon’ traditional methods when attempting to enforce new regulations. The carrot represents an incentive for changing behaviour. For example, governments offering subsidy grants to buy electric cars, or adding additional taxes to diesel cars. Next there is the whip, for instance, banning smoking in all public places, banning the use of diesel cars in cities. The third policy instrument is the sermon. Examples of this include information campaigns about the dangers of smoking or how to ‘go green’. Table 9 shows an overview of the three policy instruments for behaviour change.

Table 9: Overview of the three policy instruments for behaviour change

Topic	1. Carrot	2. Stick	3. Sermon
	Incentives	Mandates and bans	Information campaigns
Description	Rewarding desired behaviour	Make undesired / unwanted behaviour illegal	Inform public what the desired 'good' behaviour is
Example	Offering subsidies to buy electric cars (Gómez Vilchez and Thiel 2019) Charging higher taxes to drive diesel cars (Dimitropoulos et al. 2016)	Ban the manufacture of diesel cars (Möhner 2018) Make smoking illegal in public places (Au, Su, and Yuan 2012)	Communication campaign for protecting the environment by 'going green' (Saini 2013) Campaigns about the dangers of smoking (Durkin, Brennan, and Wakefield 2012)

However, an issue with these traditional regulation methods was that they assumed that individuals would behave in a rational manner. However, as evidence tells us, individuals do not often behave in a rational manner and may not always adhere to these types of policy guidelines. As a result, behavioural economists are increasingly attempting to 'alter' how rules and regulations can be most effective at changing behaviour. One suggested method is to use nudges to encourage behaviour change

2.5 Nudges

Nudge theory was originally proposed in US ‘behavioural economics’ literature, credited mainly to American academics Thaler & Sunstein.. They present an “influential account of why ‘choice architecture’ should be used to ‘nudge’ people into making better decisions than they would otherwise make” (Selinger and Whyte 2011) Their book, *Nudge: Improving Decisions about Health, Wealth and Happiness* defines a nudge as “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives”.

A **nudge** is a technique used by choice architects in order to change someone’s behaviour in a very easy and low-cost way, without reducing the number of choices available. We often see it described as “**non-enforced compliance**”. Choice architects and policy makers aim to change people’s behaviour and alter their decisions more effectively using a nudge rather than relying on fresh pieces of legislation or direct enforcement. Table 10 illustrates the difference between a traditional, enforced change and a nudge technique. Nudge theory is generally used to describe situations where nudges are used to improve the life and wellbeing of people and society (Baldwin 2014).

Table 10 – regulation vs nudge example

Enforced Change	Nudge Intervention
Weekly food shop budget	Using a basket instead of a trolley
Calorie counting	Using a smaller plate
Littering fines	Improving availability and visibility of bins

Several types of nudges have been proposed and used to change consumer behaviours. They include changing the physical environment (Lehner, Mont, and Heiskanen 2016; Aldred et al. 2017), using default options (Torma, Aschemann-Witzel, and Thøgersen 2018; Friis et al. 2017), changing social norms (Crocker et al. 2009) and using social influence (Tong et al. 2018), using reminders (Foster et al. 2017) and framing of messages (Rosenblatt et al. 2019; Graham and Abrahamse 2017). Table 11 provides a descriptive breakdown of these nudge categories.

Table 11: nudge categories

Nudge category	Nudge definition
Changes to environment	Restructuring the environment can influence behaviour. For example, designing a building with fewer lifts will encourage people to take the stairs, thereby increasing their physical activity.
Change default settings	People often behave automatically. Making the desired behaviour the automatic option can help to influence change. For example, making salad the default option instead of chips, or confining sugary and fatty food to a single, more hard-to-get-to aisle at a supermarket.
Using norms	This involves harnessing the “bandwagon effect” by presenting the behaviour as one that a lot of people are adopting. People tend to be more motivated to do something if other people are doing it.
Social influence	Social influence refers to the ways in which our behaviour is affected by what other people do, or by what other people think (Welch et al. 2018). For example, would somebody be more willing to start recycling if they knew that their friends were all recycling? A number of insights from theories of social influence have been applied as part of interventions to encourage resource conservation, such as the use of social norms (unwritten rules of behaviour that are considered acceptable in a group or society) , social learning (people learning from one another, via observation, imitation, and modelling), and social comparison processes (people coming to know themselves by evaluating their own attitudes, abilities, and traits in comparison with others).
Social modelling	People are more likely to commit to something if they see other people undertaking the behaviour.
Reminders	A nudge that causes someone to remember something.
Framing	Another common nudge is to present the same situation from a different perspective. This is called “framing”. For example, presenting a situation in terms of what someone will lose or miss out on is often better at changing behaviour than focusing on what they will gain.

2.5.1 The effectiveness of nudges

Nudges have several benefits over other policy tools. They are low cost compared to other policy options (like tax incentives) commonly used to change behaviour. However, some authors argue that nudges are ethically wrong because they are a form of manipulation. Notwithstanding these ethical concerns, nudge theory has been successfully used to reduce consumption in the energy (Szasz et al. 2018; Momsen and Stoerk 2014), and transportation sectors (Avineri 2012; Drews, Exadaktylos, and van den Bergh 2020), which significantly contribute to greenhouse gas emissions. As well as having been effective in other areas such as healthcare (Patel, Volpp, and Asch 2018; Nagtegaal et al. 2019). Table 12 provides a breakdown of how nudges have been effective at changing behaviour.

Table 12: nudge intervention examples

Nudge category	Example	Evidence of effectiveness
Changes to environment	<i>Transport</i> - Creating separate cycling facilities along heavily travelled roads, sufficient parking spaces for bikes, and the integration of cycling with public transport	Changing the environment encouraged higher levels of cycling as a means of transport (Lehner, Mont, and Heiskanen 2016)
Change default settings	<i>Environmental conservation</i> – Asking universities to change their default printer setting from “print on one side” to “print on both sides.”	Changing printer default settings resulted in paper consumption being reduced by well over 55 million sheets (4,650 trees), over the first four years of the change, equivalent to a 44% reduction. This simple example shows how the default option can be utilized to nudge individuals toward environmentally beneficial behaviours, such as paper reduction (Sunstein and Reisch 2014)
Using norms	<i>Electricity consumption</i> - A energy company OPOWER sent out Home Energy Report letters to over 600,000 U.S. residential utility customers, comparing	Using a ‘social norm’ energy saving campaign resulted in an energy use decreasing between 1.4% and 3.3%, with an average energy consumption reduction of 2% (Allcott 2011)

	their electricity use to that of their neighbours	
Social influence	<i>Insulin Management</i> – Text messages being sent to patients who were at high risk of diabetes and regularly forgot to take their insulin injections. The intervention group received message tailored to social subjective norms, “You can make friends and family happier by correctly administering your insulin injections today”. Whilst the control group received either no message reminders or a standard message such as “don’t forget to administer your insulin injections today.”	The results showed that messages tailored to ‘society’ or from a social perspective were more effective at encouraging participants to take their insulin than those who received no message or those who received a standard message (Louch et al. 2013)
Social modelling	<i>Diabetes Management</i> - Participants took part in a learning session whereby they openly discussed in the group, their experiences in relation to having diabetes.	The results showed that participants learned from other people's approaches to diabetes management and could copy best practices from each other (Garrett et al. 2005)
Reminders	<i>Medication reminders</i> - reminders sent three times per week. A sample reminder text message is “Medication reminder! Don’t leave home without your medications.”	The results showed that patients who were sent weekly reminders were more likely to take their medication than those who received no reminders. (Wille, King, and Abdulkadirov 2016)
Framing	<i>Physical activity</i> - Patients in the intervention group were given pedometers and sent positive (gain framed) messages to encourage them to increase their daily step count from one visit to the next e.g., “walking will help you become healthily”. Patients in the control group were encouraged to increase the average daily time spent walking from one visit to another without using a pedometer or personalised messages.	The results showed that the gain framed message group had a significant positive impact on behaviour and time spent walking compared to patients in the control group. (Ledford 2012)

3 Next Steps and recommendations

Human behaviours are 'complex' with numerous and varied determinants, the effectiveness of behaviour incentives to change behaviour can be influenced by a number of factors. The evidence from different design interventions tells us that "one size fits all approach", may not work. More research is needed regarding behaviour incentives such as 'who do they work for?', 'how do they work?' and 'is it acceptable and appropriate to use them?' The findings from this task indicate that behaviour change incentives have been effective in a number of different areas such as health and climate change. However, it remains unclear how effective these interventions will be in the context of food waste. Table 13 provides a description of some of the main findings and suggested recommendations on how they might be applied in the context of food waste

Table 13: main research recommendations

Title	Example	Description of how intervention works
Behavioural	<ul style="list-style-type: none"> • Perception that food waste isn't an individual responsibility • Low food awareness • Feeling that food waste isn't a big problem • Message framing • Incentives 	<p>Survey to understand food awareness levels and perceptions.</p> <p>Survey experiment to look at which experiment works better.</p> <p>Message framing strategies, for instance, could be tested to see if the way in which a message is worded could influence decisions.</p>
Socio-demographics	<ul style="list-style-type: none"> • Having children • Type of household • Main person responsible for household shopping • Number of young people in household • Household income 	<p>There is a need to investigate who is primarily responsible in the household for cooking most meals and grocery shopping.</p> <p>Potential to examine if low-income families (i.e. those receiving food stamps) waste more of certain food products</p>
Social influence	<p>Food waste recyclers encouraging their neighbours to either reduce their food waste or to 'recycle' their food waste</p>	<p>This relies on the notion that people are more likely to take action if information is provided by someone in their social network. The stronger the ties in their social network the more likely the information will affect behaviour. E.g. if everyone in their family/social bubble uses food waste containers, they are more likely to accept this social behaviour.</p>
'Commitment contracts'	<p>signing a community pledge to help reduce their food waste levels</p>	<p>Publicly binding someone to a behaviour has been linked to the need for consistency and social pressure to adhere to the commitment.</p>

Social modelling	a couple showing their neighbours how to plant vegetables	People are more likely to commit to something if they see other people undertaking the behaviour.
Nudges	Reminders for people to perform food waste preventing behaviours	<ul style="list-style-type: none"> • Breaking a behaviour down into small, achievable steps • Setting goals • Signposting progress • Acknowledging and congratulating small successes • Sending reminders and alerts • Framing the benefits of the desired behaviour in a certain way • Highlighting the immediate benefits of the desired behaviour • Addressing common barriers by providing easy solutions
Information	receive information and instructions on how to improve food handling	provide tips and tricks on how to plan a meal; prolong shelf life, increase inventory overview, estimate food safety
Social media	Using a media platform to provide feedback - provide people with information about the amount of food they have wasted or saved	<p>providing continuous feedback seems to work better than giving it within a fixed time interval (daily or weekly)</p> <p>Goal setting apps have been found to be particular popular with millennials (Swann et al. 2020)</p>
Mass media	Using mass media programs to encourage more people to be aware about food waste	<p>Combine mass media campaigns with programmes in schools, the community, or both</p> <p>Ensure that the campaign designer specifies the target audience; to ensure that the better tailored the campaign can be to that audience's demands and interests.</p>

Making it easy	Changing situational conditions can make it easier for people to perform food waste preventing behaviours.	<p>placing recycling bins in a convenient location</p> <p>smart fridges or advanced storing equipment or packaging</p> <p>Making purchasing options easier</p> <p>Examining 'Buy one get one free' (BOGOF) promotions and multi-purchase discounts options</p>
Competition	comparative feedback, where people do not (only) receive information on their own behaviour, but also on that of others	Providing information on how much local neighbourhoods recycle or reduce food waste
Validation	Validation consists of establishing and documenting the scientific evidence that food waste interventions are effective. That proof can come from a variety of sources (e.g., scientific literature, in-house studies, mathematical modelling, and regulatory resources).	<p>Ensuring consumers understand why changing their behaviour is important.</p> <p>Understanding how reducing food waste levels can have positive impacts on their daily life.</p>

4 References

- Achat, Helen, Peter McIntyre, and Margaret Burgess. 1999. 'Health care incentives in immunisation', *Australian and New Zealand journal of public health*, 23: 285-88.
- Adams, Leen, Tineke Faseur, and Maggie Geuens. 2011. 'The influence of the self-regulatory focus on the effectiveness of stop-smoking campaigns for young smokers', *Journal of Consumer Affairs*, 45: 275-305.
- Aldred, Rachel, Bridget Elliott, James Woodcock, and Anna Goodman. 2017. 'Cycling provision separated from motor traffic: a systematic review exploring whether stated preferences vary by gender and age', *Transport reviews*, 37: 29-55.
- Allara, Elias, Marica Ferri, Alessandra Bo, Antonio Gasparrini, and Fabrizio Faggiano. 2015. 'Are mass-media campaigns effective in preventing drug use? A Cochrane systematic review and meta-analysis', *BMJ open*, 5.
- Allcott, Hunt. 2011. 'Social norms and energy conservation', *Journal of public Economics*, 95: 1082-95.
- Atusingwize, Edwinah, Sarah Lewis, and Tessa Langley. 2015. 'Economic evaluations of tobacco control mass media campaigns: a systematic review', *Tobacco control*, 24: 320-27.
- Au, William W, Daisy Su, and Jiang Yuan. 2012. 'Cigarette smoking in China: public health, science, and policy', *Reviews on environmental health*, 27: 43-49.
- Avineri, Erel. 2012. 'On the use and potential of behavioural economics from the perspective of transport and climate change', *Journal of Transport Geography*, 24: 512-21.
- Baldwin, Robert. 2014. 'From regulation to behaviour change: giving nudge the third degree', *The Modern Law Review*, 77: 831-57.
- Barte, Jeroen CM, and GC Wanda Wendel-Vos. 2017. 'A systematic review of financial incentives for physical activity: the effects on physical activity and related outcomes', *Behavioral medicine*, 43: 79-90.
- Bíró, Anikó. 2015. 'Did the junk food tax make the Hungarians eat healthier?', *Food Policy*, 54: 107-15.
- Bowen, Frances, and Panos Panagiotopoulos. 2020. 'Regulatory roles and functions in information-based regulation: a systematic review', *International Review of Administrative Sciences*, 86: 203-21.
- Bryant, Jamie, Billie Bonevski, Chris Paul, Patrick McElduff, and John Attia. 2011. 'A systematic review and meta-analysis of the effectiveness of behavioural smoking cessation interventions in selected disadvantaged groups', *Addiction*, 106: 1568-85.
- Cahill, Kate, Jamie Hartmann-Boyce, and Rafael Perera. 2015. 'Incentives for smoking cessation', *Cochrane Database of Systematic Reviews*.

- Cameron, Andrew M, Allan B Massie, Charles E Alexander, B Stewart, Robert A Montgomery, NR Benavides, GD Fleming, and Dorry L Segev. 2013. 'Social media and organ donor registration: the Facebook effect', *American Journal of Transplantation*, 13: 2059-65.
- Cao, Bolin, Somya Gupta, Jiangtao Wang, Lisa B Hightow-Weidman, Kathryn E Muessig, Weiming Tang, Stephen Pan, Razia Pendse, and Joseph D Tucker. 2017. 'Social media interventions to promote HIV testing, linkage, adherence, and retention: systematic review and meta-analysis', *Journal of medical Internet research*, 19: e394.
- Cavill, Nick, and Adrian Bauman. 2004. 'Changing the way people think about health-enhancing physical activity: do mass media campaigns have a role?', *Journal of sports sciences*, 22: 771-90.
- Crocker, Helen, KL Whitaker, Lucy Cooke, and Jane Wardle. 2009. 'Do social norms affect intended food choice?', *Preventive medicine*, 49: 190-93.
- Dimitropoulos, Alexandros, Jos N van Ommeren, Paul Koster, and Piet Rietveld. 2016. 'Not fully charged: Welfare effects of tax incentives for employer-provided electric cars', *Journal of Environmental Economics and Management*, 78: 1-19.
- Drews, Stefan, Filippas Exadaktylos, and Jeroen CJM van den Bergh. 2020. 'Assessing synergy of incentives and nudges in the energy policy mix', *Energy Policy*, 144: 111605.
- Durkin, Sarah, Emily Brennan, and Melanie Wakefield. 2012. 'Mass media campaigns to promote smoking cessation among adults: an integrative review', *Tobacco control*, 21: 127-38.
- Ejlertskov, Katrine T, Stephen J Sharp, Martine Stead, Ashley J Adamson, Martin White, and Jean Adams. 2018. 'Supermarket policies on less-healthy food at checkouts: Natural experimental evaluation using interrupted time series analyses of purchases', *PLoS medicine*, 15: e1002712.
- Elder, Randy W, Ruth A Shults, David A Sleet, James L Nichols, Robert S Thompson, Warda Rajab, and Task Force on Community Preventive Services. 2004. 'Effectiveness of mass media campaigns for reducing drinking and driving and alcohol-involved crashes: a systematic review', *American journal of preventive medicine*, 27: 57-65.
- Foster, Juliet M, Helen K Reddel, Tim Usherwood, Susan M Sawyer, and Lorraine Smith. 2017. 'Patient-perceived acceptability and behaviour change benefits of inhaler reminders and adherence feedback: a qualitative study', *Respiratory Medicine*, 129: 39-45.

- Foxcroft, David R, Maria Teresa Moreira, Nerissa ML Almeida Santimano, and Lesley A Smith. 2015. 'Social norms information for alcohol misuse in university and college students', *Cochrane Database of Systematic Reviews*.
- Friis, Rasmus, Laurits Rohden Skov, Annemarie Olsen, Katherine Marie Appleton, Laure Saulais, Caterina Dinnella, Heather Hartwell, Laurence Depezay, Erminio Monteleone, and Agnès Giboreau. 2017. 'Comparison of three nudge interventions (priming, default option, and perceived variety) to promote vegetable consumption in a self-service buffet setting', *PloS one*, 12: e0176028.
- Garrett, Nancy, Christine M Hageman, Shalamar D Sibley, Michael Davern, Mary Berger, Carol Brunzell, Karen Malecha, and Steven W Richards. 2005. 'The effectiveness of an interactive small group diabetes intervention in improving knowledge, feeling of control, and behavior', *Health Promotion Practice*, 6: 320-28.
- Giles, Emma L, Shannon Robalino, Elaine McColl, Falko F Sniehotta, and Jean Adams. 2014. 'The effectiveness of financial incentives for health behaviour change: systematic review and meta-analysis', *PloS one*, 9: e90347.
- Giles, Emma L, Falko F Sniehotta, Elaine McColl, and Jean Adams. 2016. 'Acceptability of financial incentives for health behaviour change to public health policymakers: A qualitative study', *BMC Public Health*, 16: 1-11.
- Giustini, Dean, Syed Mustafa Ali, Matthew Fraser, and Maged N Kamel Boulos. 2018. 'Effective uses of social media in public health and medicine: a systematic review of systematic reviews', *Online Journal of Public Health Informatics*, 10.
- Gómez Vilchez, Jonatan J, and Christian Thiel. 2019. 'The effect of reducing electric car purchase incentives in the European Union', *World Electric Vehicle Journal*, 10: 64.
- Graham, Thomas, and Wokje Abrahamse. 2017. 'Communicating the climate impacts of meat consumption: The effect of values and message framing', *Global environmental change*, 44: 98-108.
- Jochelson, Karen. 2007. 'Paying the patient', *Improving health using financial incentives. King's Fund*.
- Kim, Jinyoung, Xiaoxia Cao, and Eric Meczowski. 2018. 'Does stigmatization motivate people to quit smoking? Examining the effect of stigmatizing anti-smoking campaigns on cessation intention', *Health communication*, 33: 681-89.
- Kraak, Vivica I, and Katherine Consavage Stanley. 2021. 'A Systematic Scoping Review of Media Campaigns to Develop a Typology to Evaluate Their Collective Impact on Promoting Healthy Hydration Behaviors and Reducing Sugary Beverage Health Risks', *International Journal of Environmental Research and Public Health*, 18: 1040.
- Lavigne, Franck, Benjamin De Coster, Nancy Juvin, François Flohic, Jean-Christophe Gaillard, Pauline Texier, Julie Morin, and Junun Sartohadi. 2008. 'People's behaviour

- in the face of volcanic hazards: Perspectives from Javanese communities, Indonesia', *Journal of Volcanology and Geothermal Research*, 172: 273-87.
- Ledford, Christy JW. 2012. 'Exploring the interaction of patient activation and message design variables: Message frame and presentation mode influence on the walking behavior of patients with type 2 diabetes', *Journal of Health Psychology*, 17: 989-1000.
- Lehner, Matthias, Oksana Mont, and Eva Heiskanen. 2016. 'Nudging—A promising tool for sustainable consumption behaviour?', *Journal of Cleaner Production*, 134: 166-77.
- Lidón-Moyano, Cristina, Jose M Martínez-Sánchez, Marcela Fu, Montse Ballbè, Juan Carlos Martín-Sánchez, Cristina Martínez, Esteve Saltó, and Esteve Fernández. 2017. 'Impact of the Spanish smoking legislations in the adoption of smoke-free rules at home: a longitudinal study in Barcelona (Spain)', *Tobacco control*, 26: 557-62.
- Louch, Gemma, Sonia Dalkin, Jonathan Bodansky, and Mark Conner. 2013. 'An exploratory randomised controlled trial using short messaging service to facilitate insulin administration in young adults with type 1 diabetes', *Psychology, health & medicine*, 18: 166-74.
- Ludolph, Ramona, and Peter J Schulz. 2015. 'Does regulatory fit lead to more effective health communication? A systematic review', *Social science & medicine*, 128: 142-50.
- Maher, Carol A, Lucy K Lewis, Katia Ferrar, Simon Marshall, Ilse De Bourdeaudhuij, and Corneel Vandelanotte. 2014. 'Are health behavior change interventions that use online social networks effective? A systematic review', *Journal of medical Internet research*, 16: e40.
- Mantzari, Eleni, Florian Vogt, Ian Shemilt, Yinghui Wei, Julian PT Higgins, and Theresa M Marteau. 2015. 'Personal financial incentives for changing habitual health-related behaviors: a systematic review and meta-analysis', *Preventive medicine*, 75: 75-85.
- McPoland, Aimee, Sinéad Furey, and Christopher McLaughlin. 2020. 'Consumers' Purchasing Decisions for Confectionery and Savoury Snack Food Items on and off Promotion', *DBS Business Review*, 3.
- Michie, Susan, Maartje M Van Stralen, and Robert West. 2011. 'The behaviour change wheel: a new method for characterising and designing behaviour change interventions', *Implementation science*, 6: 42.
- Miller, Sylvia A, M Suzanne Clinton, and John P Camey. 2007. 'The relationship of motivators, needs, and involvement factors to preferences for military recruitment slogans', *Journal of Advertising Research*, 47: 66-78.

- Mitchell, Marc S, Stephanie L Orstad, Aviroop Biswas, Paul I Oh, Melanie Jay, Maureen T Pakosh, and Guy Faulkner. 2020. 'Financial incentives for physical activity in adults: systematic review and meta-analysis', *British journal of sports medicine*, 54: 1259-68.
- Möhner, Matthias. 2018. "Driving ban for diesel-powered vehicles in major cities: an appropriate penalty for exceeding the limit value for nitrogen dioxide?" In.: Springer.
- Momsen, Katharina, and Thomas Stoerk. 2014. 'From intention to action: Can nudges help consumers to choose renewable energy?', *Energy Policy*, 74: 376-82.
- Nagtegaal, Rosanna, Lars Tummers, Mirko Noordegraaf, and Victor Bekkers. 2019. 'Nudging healthcare professionals towards evidence-based medicine: A systematic scoping review', *Journal of Behavioral Public Administration*, 2.
- Patel, Mitesh S, Kevin G Volpp, and David A Asch. 2018. 'Nudge units to improve the delivery of health care', *The New England journal of medicine*, 378: 214.
- Rode, Julian, Erik Gómez-Baggethun, and Torsten Krause. 2015. 'Motivation crowding by economic incentives in conservation policy: A review of the empirical evidence', *Ecological Economics*, 117: 270-82.
- Rosenblatt, Daniel H, Helen Dixon, Melanie Wakefield, and Stefan Bode. 2019. 'Evaluating the influence of message framing and graphic imagery on perceptions of food product health warnings', *Food Quality and Preference*, 77: 32-42.
- Saini, Babita. 2013. 'Green marketing and its impact on consumer buying behavior', *International Journal of Engineering Science Invention*, 2: 61-64.
- Schanes, Karin, Karin Dobernig, and Burcu Gözet. 2018. 'Food waste matters-A systematic review of household food waste practices and their policy implications', *Journal of Cleaner Production*, 182: 978-91.
- Schmid-Petri, Hannah, Silke Adam, Ivo Schmucki, and Thomas Häussler. 2017. 'A changing climate of skepticism: The factors shaping climate change coverage in the US press', *Public Understanding of Science*, 26: 498-513.
- Seal, Karen H, Alex H Kral, Jennifer Lorvick, Alex McNeese, Lauren Gee, and Brian R Edlin. 2003. 'A randomized controlled trial of monetary incentives vs. outreach to enhance adherence to the hepatitis B vaccine series among injection drug users', *Drug and Alcohol Dependence*, 71: 127-31.
- Selinger, Evan, and Kyle Whyte. 2011. 'Is there a right way to nudge? The practice and ethics of choice architecture', *Sociology Compass*, 5: 923-35.
- Sunstein, Cass R, and Lucia A Reisch. 2014. 'Automatically green: Behavioral economics and environmental protection', *Harv. Envtl. L. Rev.*, 38: 127.
- Swann, Christian, Simon Rosenbaum, Alex Lawrence, Stewart A Vella, Desmond McEwan, and Panteleimon Ekkekakis. 2020. 'Updating goal-setting theory in physical activity promotion: a critical conceptual review', *Health psychology review*: 1-17.

- Szaszi, Barnabas, Anna Palinkas, Bence Palfi, Aba Szollosi, and Balazs Aczel. 2018. 'A systematic scoping review of the choice architecture movement: Toward understanding when and why nudges work', *Journal of Behavioral Decision Making*, 31: 355-66.
- Tay, Richard. 2005. 'Mass media campaigns reduce the incidence of drinking and driving', *Evidence-Based Healthcare and Public Health*, 9: 26-29.
- Thompson, Lee E, J Ross Barnett, and James R Pearce. 2009. 'Scared straight? Fear-appeal anti-smoking campaigns, risk, self-efficacy and addiction', *Health, risk & society*, 11: 181-96.
- Tompa, Emile, Christina Kalcevich, Michael Foley, Chris McLeod, Sheilah Hogg-Johnson, Kim Cullen, Ellen MacEachen, Quenby Mahood, and Emma Irvin. 2016. 'A systematic literature review of the effectiveness of occupational health and safety regulatory enforcement', *American journal of industrial medicine*, 59: 919-33.
- Tong, Xin, Igor Nikolic, Bob Dijkhuizen, Maurits van den Hoven, Melle Minderhoud, Niels Wäckerlin, Tao Wang, and Dongyan Tao. 2018. 'Behaviour change in post-consumer recycling: Applying agent-based modelling in social experiment', *Journal of Cleaner Production*, 187: 1006-13.
- Torma, Gabriele, Jessica Aschemann-Witzel, and John Thøgersen. 2018. 'I nudge myself: exploring 'self-nudging' strategies to drive sustainable consumption behaviour', *International journal of consumer studies*, 42: 141-54.
- Vink, Martinus J, Art Dewulf, and Catrien Termeer. 2013. 'The role of knowledge and power in climate change adaptation governance: a systematic literature review', *Ecology and Society*, 18.
- Volpp, Kevin G, Leslie K John, Andrea B Troxel, Laurie Norton, Jennifer Fassbender, and George Loewenstein. 2008. 'Financial incentive-based approaches for weight loss: a randomized trial', *Jama*, 300: 2631-37.
- Wakefield, Melanie A, Barbara Loken, and Robert C Hornik. 2010. 'Use of mass media campaigns to change health behaviour', *The Lancet*, 376: 1261-71.
- Weiss, Janet A, and Mary Tschirhart. 1994. 'Public information campaigns as policy instruments', *Journal of policy analysis and management*, 13: 82-119.
- Welch, Vivian, Jennifer Petkovic, Rosiane Simeon, Justin Presseau, Diane Gagnon, Alomgir Hossain, Jordi Pardo Pardo, Kevin Pottie, Tamara Rader, and Alexandra Sokolovski. 2018. 'Interactive social media interventions for health behaviour change, health outcomes, and health equity in the adult population', *The Cochrane database of systematic reviews*, 2018.

- White, Victoria, N Tan, Melanie Wakefield, and David Hill. 2003. 'Do adult focused anti-smoking campaigns have an impact on adolescents? The case of the Australian National Tobacco Campaign', *Tobacco control*, 12: ii23-ii29.
- Wille, David, Scott P King, and Sherzod Abdukadirov. 2016. 'Taking Paternalism Out of Nudge: The Case of Medication Nonadherence among Patients with Chronic Conditions'.
- Williams, Gillian, Michele P Hamm, Jocelyn Shulhan, Ben Vandermeer, and Lisa Hartling. 2014. 'Social media interventions for diet and exercise behaviours: a systematic review and meta-analysis of randomised controlled trials', *BMJ open*, 4.
- Young, Ben, Sarah Lewis, Srinivasa Vittal Katikireddi, Linda Bauld, Martine Stead, Kathryn Angus, Mhairi Campbell, Shona Hilton, James Thomas, and Kate Hinds. 2018. 'Effectiveness of mass media campaigns to reduce alcohol consumption and harm: a systematic review', *Alcohol and alcoholism*, 53: 302-16.
- Young, William, Sally V Russell, Cheryl A Robinson, and Ralf Barkemeyer. 2017. 'Can social media be a tool for reducing consumers' food waste? A behaviour change experiment by a UK retailer', *Resources, Conservation and Recycling*, 117: 195-203.
- Yuriev, Alexander, Olivier Boiral, Virginie Francoeur, and Pascal Paillé. 2018. 'Overcoming the barriers to pro-environmental behaviors in the workplace: A systematic review', *Journal of Cleaner Production*, 182: 379-94.