Cigarette Butt Littering Research: Report Summary

Designed to help inform Clean Up Britain's behavioural change campaign in Bristol

Prepared for: Clean Up Britain
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Introduction

Clean Up Britain (CLUB) is undertaking a campaign with the aim of finding sustainable and effective solutions to Britain's large-scale problem with cigarette butt littering. Decision Technology (Dectech), one of the longest-established behavioural science consultancies, has joined CLUB's endeavour, to help them design behaviourally-informed, long-lasting interventions with the potential of bringing cigarette butt littering in the UK to a definitive halt. This report presents what we recommend and why.

Project Steps

The collaboration was undertaken in four steps.

1. First, Dectech undertook an in-depth **evidence review**, gathering all the academic research, government materials and third party publications on cigarette butt littering. As part of this, Dectech also interviewed leading experts in the field of littering, environmental pollution, cigarette filter production and cigarette butt littering prevention

2. Secondly, the team ran a **large-scale study**, interviewing 3000 smokers, vapers and non-smokers in an online survey, which recorded demographics, littering behaviour, attitudes and knowledge. The survey also tested the impact of a range of messaging angles aimed at reducing cigarette butt littering.

3. Next, CLUB and Dectech came together in an **in-person workshop**, to review the evidence and the survey results to launch a creative process aimed at designing interventions to be deployed in the UK.

4. Finally, this **report** was written, to bring together the evidence review, the survey results and the workshop conclusions into a single document to be referred to and disseminated.

The following sections dive into the **what, who, where / when** and **why** of cigarette butt littering, followed by **how** the issue can be tackled. All results come from the evidence review and from the findings from the smoker survey.

What is the size of the issue?

- Cigarette butt litter is hard to measure, making it difficult to know the exact size of the problem.

- However, it is clear that it is a large issue, with estimates of millions of cigarettes littered in the UK every day.

- Independent parties have found smoking related littering to be the most prevalent form of litter in England, making up 68% of all littered items.

- The smoker survey showed an average smoking rate of 14 cigarettes per day, per smoker. Of those, smokers report littering 10% of cigarette butts.

- If this is extended to the 7m UK smokers, this amounts to 9.6 million cigarettes littered every day and 3.5bn cigarettes littered in the UK every year.

- In a typical week, more than one third of smokers report having thrown at least one butt on the ground.

Who are the cigarette butt litterers?

- Younger males (especially students) are most likely to litter cigarette butts, whereas education and income are negatively correlated with littering behaviour.

- However, demographics alone only explain a very small portion of littering behaviour (e.g., age only explains 1%).

- When controlling for behavioural differences, such as location of smoking, demographics no longer predict littering behaviour.

- Littering behaviour is better explained by how connected smokers feel to their community (the less connected, the more likely to litter) and their level of social rebelliousness (the higher, the more likely to litter).

- Smokers who litter their butts are also more likely to smoke hand-rolled cigarettes and to litter other items, such as plastic food wrappers.

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Where and when are cigarettes littered?

- Location of smoking has a particularly strong impact on littering behaviour.

- People smoking outside are more likely to litter than those who smoke indoors (11% vs 7% littering rate). This is especially the case if people smoke in a park.

- Other outdoor littering hotspots are the areas outside HORECAs (hotels, restaurants, cafes) and outside transportation hubs.

- However, smoking in a vehicle is the worst littering location, with 33% of cigarettes littered, particularly when smoking in a moving vehicle.

- After accounting for smoking location, time of day has no effect on cigarette littering behaviour.

Why do smokers litter?

The Behaviour Change Wheel

In order to gain an in-depth understanding of the drivers and barriers of cigarette butt littering, and the later interventions aimed at tackling them, we used a well-known behavioural framework named the Behaviour Change Wheel (BCW). The BCW was designed to aid intervention designers in the behavioural analysis of a problem and the later design of an evidence-based intervention method.

The BCW is made of three concentric circles (see Figure A), each defining a level of inquiry. The central circle represents the sources of behaviour (in this case, the drivers and barriers to cigarette butt littering). The middle circle shows the intervention functions (types of interventions to tackle cigarette butt littering). The external circle represents the policy categories. For the purpose of this project, the research was focused on the two first circles.

Figure A. The Behaviour Change Wheel (BCW)
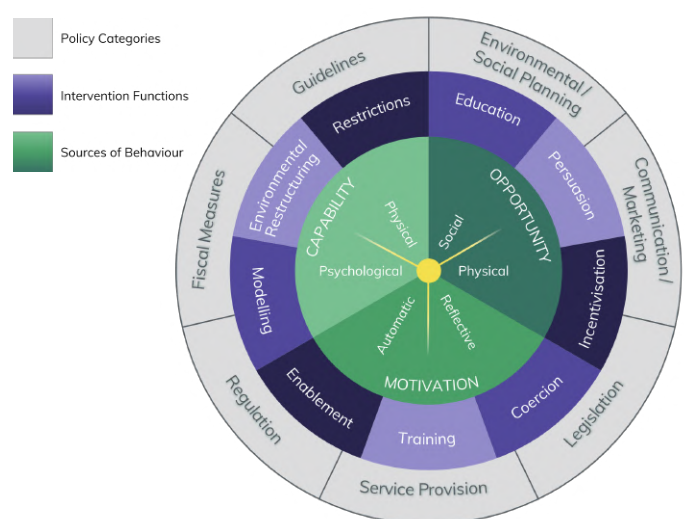
Source: Johnson, B., Zarnowiecki, D., Hendrie, G., Mauch, C., & Golley, R. (2018). How to reduce parental provision of unhealthy foods to 3-to 8-year-old children in the home environment? A systematic review utilizing the Behaviour Change Wheel framework. Obesity Reviews, 19, pp. https://doi.org/10.1111/obr.12702

The following section on the "why's" of cigarette butt littering focuses on the inner circle of the BCW, while the later section on the "how" of tackling butt litter, follows the structure of the second circle.

Source of behaviour 1: Capability

One important driver of cigarette butt littering is 'capability': can the correct behaviour be accomplished in principle? Capability includes both physical capability (e.g., physical strength) and psychological capability (e.g., knowledge and skills).

- There are important gaps in the knowledge of smokers.

- Smokers' knowledge is particularly low regarding the composition of cigarettes, with only one third of smokers aware that they contain plastic and arsenic and less than a quarter that they contain lead.

- More than a third of smokers think that cigarette butts are biodegradable.

- However, not all knowledge is efficient in reducing cigarette butt littering.

- Littering rates are significantly higher for smokers who believe that animals cannot become ill from eating cigarette butts (60% more likely than those who know they can) and those who do not know if littering is a criminal offence (41% more likely than those who do).

- Overall, smokers with more knowledge (more correct answers) are less likely to litter. However, the effect is no longer significant when controlling for individual statements, attitudes and behaviour, showing the limited impact of providing knowledge alone.

Source of behaviour 2: Opportunity

The next driver is 'opportunity': is there sufficient opportunity for the behaviour to occur? Opportunity includes both social (e.g., training and information) and physical (e.g., environmental layout) opportunity.

- Opportunity factors are particularly strong for cigarette butt littering, with contextual variables (e.g., the number, distance and location of bins) explaining 38% of littering behaviour in smokers, while it only explains 15% of general littering behaviour.

- This may be due to cigarettes' unique nature of being small, inflammable, smelly and awkward to carry. How the environment is laid out will therefore greatly influence whether butts are disposed of correctly.

- The most prominent opportunity drivers are the clarity of the correct behaviour, the number of and distance from bins, the types of bins (does the bin have an ashtray?), the path morphology and location (how easy is it to get to the bin?), the presence of existing litter (is the bin full?) and the existence and implementation of penalties.

Figure B. Knowledge statements by smoker group

Statement	Correct Answer	Packets	Rollies	Non-Smoker
Cigarette butts contain lead	TRUE	23%	18%	18%
Cigarette butts contain plastic	TRUE	34%	35%	37%
Cigarette butts do not contain arsenic	FALSE	35%	39%	28%
Cigarette butts are biodegradable	FALSE	57%	58%	60%
It is not a criminal offence to drop a fast food wrapper on the ground*	FALSE	70%	74%	73%
Pets and wildlife can eat cigarette butts and become seriously ill*	TRUE	73%	77%	83%

*Source: Dectech Research (Sep-2021, N = 3,044) ; numbers show % answered correctly. * = in bold statements that predict cigarette littering behaviour*

Figure C. Belief statements that have a significant impact on cigarette littering behaviour

Theme	Belief	% Smokers Agree	Butts Littered Per Day if Agree	Butts Littered Per Day if Disagree
Not litter	A cigarette butt is not litter	33%	1.82	1.16
In-group norms (family)	My family thinks it is fine to throw a cigarette butt on the ground	39%	2.34	0.71
OK if in a hurry	Throwing a cigarette butt on the ground is understandable if someone is in a hurry	43%	2.21	0.68
Down the drain	Throwing a cigarette butt down the drain is fine	49%	2.07	0.73
OK if no bin	Throwing a cigarette butt on the ground is understandable if there isn't a bin or ashtray nearby	58%	2.05	0.37
Observed norm	Most smokers throw their cigarette butt on the ground	77%	1.57	0.61
Carrying difficulty	Carrying a cigarette butt with you is awkward and annoying	81%	1.56	0.58
Clean up costs	It is costly to clean up cigarette butts thrown on the ground	88%	1.28	2.05

Source: Dectech Research (Sep-2021, N = 3,044) ; table shows % smokers who agree with the statement, average number of butts littered per day if they agree and average number of butts littered per day if they disagree.

- The great importance of opportunity drivers may in part explain why location of smoking has such a great impact on littering behaviour (e.g., explain why 7% cigarettes are littered when smoked indoors vs 11% when indoors and 33% when in a vehicle).

Source of behaviour 3: Motivation

The last driver is 'motivation': is there sufficient motivation for the behaviour to occur? This includes both automatic (habitual) and reflective (thought-through) motivation and refers to smokers' beliefs and attitudes concerning cigarette butts and related littering.

- Alongside opportunity factors, motivation plays a significant role, with key smokers' attitudes and beliefs predicting littering behaviour.

- The beliefs and attitudes that most impact littering behaviour cover 1) instances where littering is seen as excusable, 2) the difficulty of carrying butts, and 3) the social acceptability of littering cigarettes.

- To reduce cigarette littering, it is most effective to convince smokers that littering is not excusable, even in situations where correct disposal of butts is more difficult.

- For example, telling smokers that it is not acceptable to throw a cigarette butt on the ground if there isn't a bin or ashtray nearby can have a high impact (the 42% of smokers who know it is not acceptable litter 6x fewer butts each year).

- Similarly, the 57% of smokers who understand it is not acceptable to throw a cigarette when one is in a hurry or that it is not acceptable to throw a cigarette down the drain litter 3x fewer butts.

- Tackling the belief that butts are awkward and annoying to carry is also effective, with the 77% of smokers who agree littering 3x more butts than those who disagree.

- Changing perceptions on the social acceptability of littering (social norms) is also highly effective, with the 39% of smokers who say that their families think it is fine to throw a cigarette on the ground being 2.2x more likely to litter.

- While family dynamics are outside the scope of most campaigns, reminding smokers that most smokers DO NOT throw their butt on the ground is particularly impactful, with the 23% of smokers who agree littering 3.3x fewer butts than those who think most smokers do litter.

- Other beliefs that are associated with higher littering rates are the belief that cigarette butts are not litter and that it is not costly to clean up littered cigarettes. However, only one third or less of smokers believe this, making their conversion impact more limited.

Attitudinal groups

The poor predictive power of demographics and the important impact of beliefs and attitudes on littering behaviour, showed that an attitudinal lens is a more effective way of segmenting and targeting the smoker population.
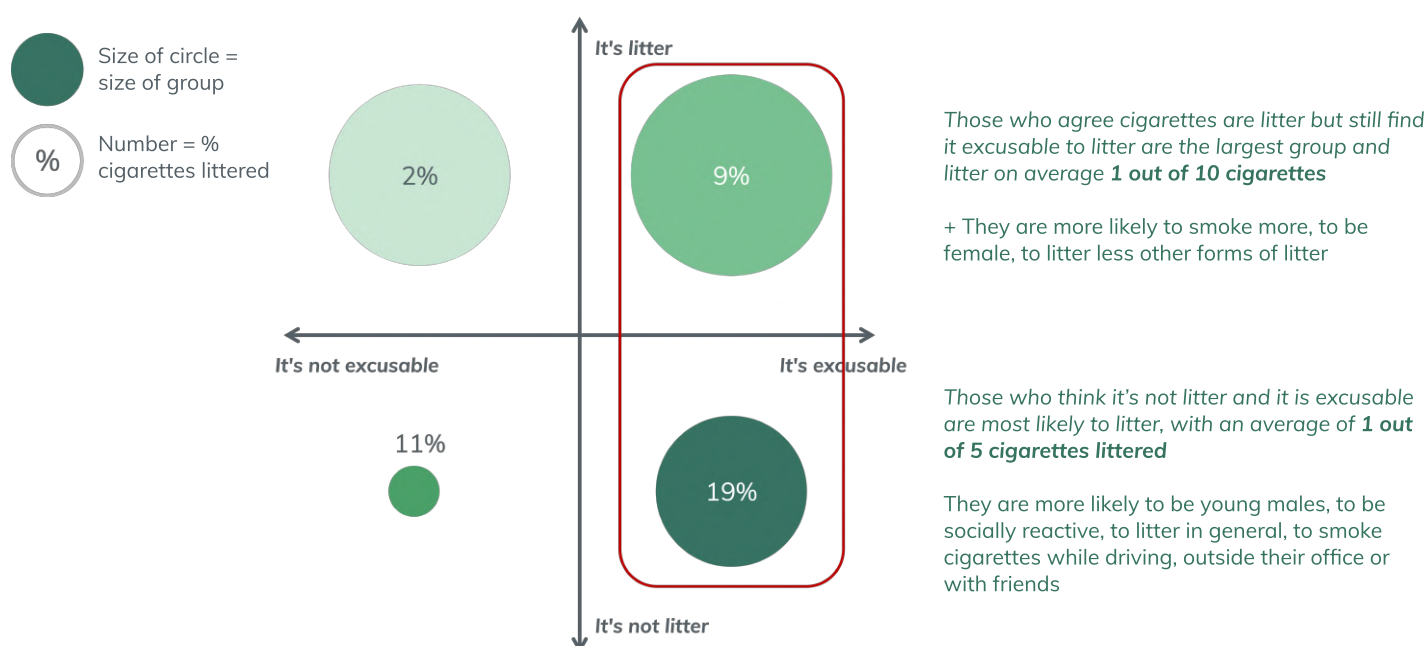
Four attitudinal groups were created, based on their agreement with two main beliefs: that cigarette butts are litter, and that littering is excusable. These four groups have different sizes, but most importantly they vary in their cigarette littering rate.

As shown in figure D, the highest littering group (litter 1 in 5 cigarettes) are the smokers who believe cigarettes are not litter and who find littering excusable. Targeting them should therefore be at the core of anti-littering campaigns. The second high littering group is

made of smokers who do know butts are litter, but still find excuses to litter. They litter half as much as the first group, but are the largest smoker group and may be an easier target for campaigns and interventions, as they have higher initial knowledge.

Figure D. The four attitudinal groups defined by belief

Size of circle = size of group

% Number = % cigarettes littered

It's litter

2%

9%

It's not excusable   It's excusable

11%

19%

It's not litter

Those who agree cigarettes are litter but still find it excusable to litter are the largest group and litter on average **1 out of 10 cigarettes**

+ They are more likely to smoke more, to be female, to litter less other forms of litter

Those who think it's not litter and it is excusable are most likely to litter, with an average of **1 out of 5 cigarettes littered**

They are more likely to be young males, to be socially reactive, to litter in general, to smoke cigarettes while driving, outside their office or with friends

Source: Dectech Research (Sep-2021, N = 3,044) ; The four attitudinal groups are defined by belief cigarettes are litter vs. finding litter is an excusable behaviour. RHS = descriptives of the two highest littering groups.

How can cigarette butt littering be reduced?

Past interventions

The evidence review recorded past interventions aimed at reducing cigarette butt litter in the UK and across the world, ranked each intervention by their effectiveness (% reduction in littering) and categorised them by intervention type, as presented in the BCW (see Figure E for a description of the intervention types).
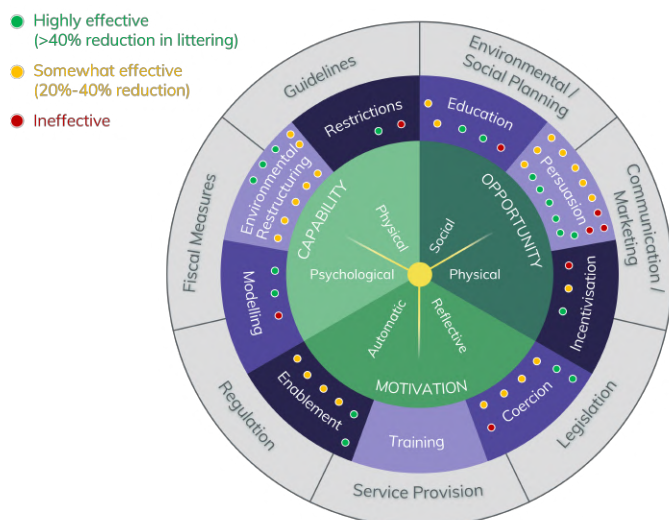
- Most recorded interventions use more than one approach, making it hard to untangle the impact of each element.

- Communication interventions alone have shown to not be enough to change behaviour when there isn't the suitable infrastructure to enact the promoted behaviour (e.g., there aren't enough bins).

- Most impactful interventions use a mix of approaches.

- The most effective campaigns include a combination of persuasion, alongside environmental restructuring (e.g., bins, changing cleaning schedules etc.) and/or enablement (e.g., portable ashtrays).

Figure E. Definition of intervention types, as per the Behaviour Change Wheel (BCW) framework

Interventions	Definition	Examples
Education	Increasing knowledge or understanding	Providing information to promote healthy eating
Persuasion	Using communication to induce positive or negative feelings or stimulate action	Using imagery to motivate increases in physical activity
Incentivisation	Creating expectation of reward	Using prize draws to induce attempts to stop smoking
Coercion	Creating expectation of punishment or cost	Raising the financial cost to reduce excessive alcohol consumption
Training	Imparting skills	Advanced driver training to increase safe driving
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)	Prohibiting sales of solvents to people under 18 to reduce use for intoxication
Environmental Restructuring	Changing the physical or social context	Providing on-screen prompts for GPs to ask about smoking behaviour
Modelling	Providing an example for people to aspire to or imitate	Using TV drama scenes involving safe-sex practices to increase condom use
Enablement	Increasing means/reducing barriers to increase capability or opportunity[1]	Behavioural support for smoking cessation, medication for cognitive deficits, surgery to reduce obesity, prostheses to promote physical activity

Source: Dectech Research (Sep-2021, N = 3,044)

Figure F. Effectiveness of past interventions

- **Highly effective** (>40% reduction in littering)
- **Somewhat effective** (20%-40% reduction)
- **Ineffective**

Source: Dectech Research (Sep-2021, N = 3,044) ; Each dot represents one intervention, with the colour indicating the effectiveness of the intervention (green = highly effective, yellow = somewhat effective, red = ineffective)

- This is in line with the finding that opportunity and motivation are the most important drivers of cigarette butt littering.

- Coercion (fines) can be useful as an added stick, but is not always necessary, requires consistent enforcement and may cause backlash.

- Social influence approaches, which have been used sporadically, are promising e.g.,

empowerment of block leaders and role models within the smoker community.

Messaging

Finding a message angle and tone that positively challenges smokers and promotes a reduction in littering behaviour is central to the design of anti-littering campaigns.

- Shame-related messaging is not effective, and can increase cigarette butt littering behaviour in smokers.

- We found no discrepancy in reported littering compared to actual littering behaviour (smokers were honest about their littering behaviour), further suggesting that smokers feel limited social shame around littering cigarette butts and shaming approaches would not be effective for this target group.

- Smokers have learnt to ignore negative messages related to smoking, and are less likely to pay attention to campaigns that use a negative tone.

- In general, positive / humorous campaigns that focus on the correct behaviour (e.g., cigarette disposal), pride and/or a sense of community have had the most success.

- Messaging should be crystal-clear, hyper-

Figure G. Campaign messages tested in the survey

29 messages

- Cost
- Fines
- Descriptive norms
- Injunctive norms
- Environmental impact
- Cigarette composition
- Responsibility
- Shaming
- Positive
- Pride

"It's a criminal offence to litter cigarette butts, and you can be fined up to £150 on the spot."

"Every day over 200 million cigarettes are littered in Britain"

"A cigarette butt dropped down a drain pollutes the water you drink and ends up in the ocean killing fish."

"Cigarette butts take up to 15 years to decompose."

"Most people hate cigarette litter, and the people who litter it."

"I'm a smoker and I care about this neighbourhood. I bin my butt or use a portable ashtray."

Source: Dectech Research (Sep-2021, N = 3,044) ; The survey tested 29 campaign messages. The light green boxes show the themes covered by those messages and the quotes on the RHS show some example messages.

local and use the language of the target audience.

Informed by the evidence review, the smoker survey tested 29 messages, covering a range of themes (see Figure G), and recorded how new the information was for smokers and how much impact the message would have on their cigarette littering behaviour.

Effective messages were identified as messages which 1) provide new information and 2) are likely to reduce cigarette butt littering.

- The ten most effective messages cover five core themes: penalty reminder, environmental impact of cigarette littering, cigarette composition, recognition of correct behaviour and social norms (see Figure H for wording).

- The most effective message announced a rise of cigarette littering fines to £1000, with 80% of smokers agreeing this would change their behaviour.

- The message is closely followed by messages on the composition of cigarette butts and the time they take to decompose (15 years), with 78% of smokers saying the message would make them reduce their littering.

- This is on par with environmental messages focused on drinking water pollution and damage to marine life.

- In general, negative messages focused on shaming / 'telling off' smokers performed poorly (20% less effective than the highest performing messages).

- The two high littering attitudinal groups mostly agree on the most effective messages, indicating a single campaign can reach the highest littering groups.

Messenger

People care about who delivers the message, and they need to feel a sense of trust towards them in order to take in the information provided.

- Environmentalists are the most trusted messengers on cigarette butt litter, indicating the possible benefit of involving them in social influence approaches.

- Next, smokers most trust neighbours and other smokers, further confirming the potential impact of hyper-local campaigns focused on the smoker community.

Figure H. Most effective messages

Theme	Message	All Smokers	Is litter Is excusable	Is not litter Is excusable
Fines	Fines for cigarette littering are rising from £150 to £1,000.	✓	✓	✓
Cigarette Composition	Cigarette butts are made of plastic and toxic chemicals and take up to 15 years to decompose.	✓	✓	✓
Environmental Impact	A cigarette butt dropped down a drain pollutes the water you drink and ends up in the ocean killing fish.	✓	✓	✓
Cigarette Composition	Cigarette butts take up to 15 years to decompose	✓	✓	✓
Environmental Impact	Cigarette butts contain toxins such as arsenic and lead that can contaminate your water and harm marine life and the environment.	✓	✓	✓
Descriptive Norm	Every day over 200 million cigarettes are littered in Britain	✓		✓
Positive	Mother Earth thanks you for binning your butt.	✓	✓	✓
Environmental Impact	Cigarette butts can reduce the growth of plants.			✓
Descriptive Norm	Cigarette butts are the most littered item in your area.			✓
Positive	Please just bin your butt. Thanks.' (Mother Earth)	✓		

Source: Dectech Research (Sep-2021, N = 3,044) ; Effective messages are those that were seen as new information and would reduce littering behaviour for at least one of the target groups. The green ticks on the RHS shows for which groups of smokers the messages were high impact (= new information AND would reduce littering behaviour).

Application

Intervention design

Figure I shows the key take-aways from the evidence review and the survey results. CLUB and Dectech came together in an in-person workshop to translate the take-aways into tangible steps to design effective interventions to reduce cigarette butt littering in the UK.

- Anti-cigarette butt littering campaigns should use a mix of interventions, to successfully tackle the different barriers to correct disposal of cigarette butts

- To address the prevalence of opportunity barriers, environmental restructuring interventions (e.g., adding ashtray bins, increasing their visibility, building smoking areas etc.) should be prioritised, especially in areas where infrastructure is limited.

- To address motivation and capability barriers, campaigns should also include an element of persuasion and education focused on the impact of cigarette littering on the environment (especially on water and wildlife), the decomposition time of cigarette butts and social norms on littering behaviour.

- Campaigns should make it clear that it is possible to be a responsible smoker, illustrating that most smokers do not litter and that special situations (e.g., being in a hurry or not being in the proximity of a bin) and the fact that butts are difficult to carry do not make littering acceptable.

- Campaigns should avoid shaming smokers and instead focus on positive or humorous messages coming from a voice they trust,

Figure I. Main take-aways from the research

Supported by evidence review   Supported by survey results

Heterogeneity
Attitudes, beliefs and behaviours predict littering behaviour more than demographics

Environment
Littering behaviour is highly influenced by the contextual environment, especially for cigarette littering

Ownership
Smokers can be motivated and empowered to do the correct behaviour from people within their peer group

Combination
Most successful interventions use a mix of approaches

Encouragement
Focus on clear and positive messages is more effective than shaming smokers further

Knowledge
There are gaps in smokers' knowledge on cigarette butts and the implications of their littering

Sustainability
Littering is a habit and the easy choice. Behaviour will only be changed through repeated and consistent action.

Action
While increasing capability is important, interventions focused on improving motivation and opportunity will have most impact

Source: Dectech Research (Sep-2021, N = 3,044) ; Main take-aways annotated by the extent to which they were supported in the evidence review (marked with a book) and in the survey results (marked with a person)

such as local champions (e.g., environmentalists) and/or other smokers.

- Social influence approaches, where smokers model the correct behaviour and share their experiences with other smokers should be considered as a way to make campaigns personal, hyper-local and to promote connection to the community.
- Fines can be effective for the smokers who have more entrenched beliefs or are more rebellious, however they should be used as a stick within a larger campaign and only be implemented if they can be visibly and consistently enforced.
- Rather than focusing on demographics, campaigns should target specific littering locations and smokers based on their beliefs, particularly those who think cigarette butts are not litter and who see littering as excusable (highest litterers) and those who know butts are litter but still find littering excusable (largest group).
- Particular attention should be given to the measurement and monitoring of campaigns' effectiveness, making sure that reliable metrics are chosen, recorded and reviewed before, during and after the interventions.

About Dectech

Dectech strives to provide the most accurate and best value forecasts available on how people will behave in new situations.

Founded in 2002, we've conducted more than 400 studies involving over three million participants. We hold that people make very different decisions depending on their context and often struggle to self-report their beliefs and motives. So we developed Behaviourlab, a randomised controlled trial approach that immerses participants in a replica of the real-world decision environment. Over the years we've shown how Behaviourlab can provide higher accuracy forecasts and more actionable insights.
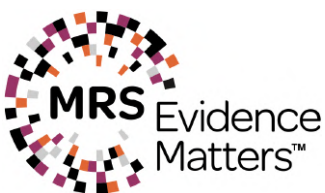
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