

Capital Ambition Board

Applying Behavioural Insights – results of trials

Item no: 5

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Summary

This cover report introduces the final reports of the two randomised controlled trials approved by CAB at their meeting of July 2016. The trials were conducted in Croydon and covered:

- Improving recycling rates; and
- Recovery of housing benefit overpayment.

Both trials were successful in changing behaviours and will leave a lasting legacy at the London Borough of Croydon. The Capital Ambition team will work with the BI team to disseminate the results such that other local authorities can benefit from this work.

Recommendations It is recommended that Board members:

- a) Receive the presentation from the BI team.
- b) Note the results of the trials.
- c) Agree to dissemination of the results via the Capital Ambition team, through established professional networks.

APPLYING BEHAVIOURAL INSIGHTS – RESULTS OF TRIALS – COVER REPORT

Background

1. At the February 2016 CAB meeting following a presentation by the Behavioural Insights Team (BIT), CAB agreed to fund two randomised controlled trials, with focusses on:

- a) Improving recycling rates; and
- b) Recovery of housing benefit overpayment.

The London Borough of Croydon took the lead and provided the support to conduct the trials.

2. These two trials were costed at a total of £100,000. As noted in the Director's report not all of the grant has been drawn down as yet – but it is anticipated the full extent of the grant will be utilised.

Highlights from the trials

3. Both trials were successful, demonstrating that the interventions used by BIT had a positive impact on the behaviours targeted.
4. To increase the repayments rates of housing benefit overpayments BIT altered the letters sent to debtors by Croydon to focus on social norms and the specific actions the debtor should take. For example debtors with smaller overpayments were told "Most people (70%) with a debt like yours choose to pay it off in one go.". The behavioural letters increased the proportion of debtors who repaid their housing benefit overpayments within 45 days by 14% compared to the standard letters. The behavioural letters also increased the amount repaid per letter sent by 25%. BIT estimate this could bring forward £212,000 per year along with £4,500 less spent on debt recovery.
5. The trial on improving recycling rates focused on sending letters to households which failed to put out their recycling. This trial was complicated by the need for Croydon's partner, Veolia, to collect live data, however it did have a moderate positive impact. Households that did not put out recycling and received letters were 6% less likely to fail to recycle in the following month. Two types of letter were used, one focused on addressing motivation to recycle, and the other on reducing informational barriers to recycling. The two interventions had similar effects, with no discernible difference by geography or deprivation level.

Dissemination of the results

6. The results of the trials suggest behavioural interventions could be a low cost method to have an impact on housing benefit overpayments and recycling rates. Croydon Council has agreed to support the dissemination of the knowledge and experience gained from these trials. BIT has recommended the extension of these interventions, particularly on housing benefit overpayments, and has also agreed to support dissemination of knowledge.
7. Local Authorities are likely to be interested in adopting these interventions. The Government recycling target of 50% means Local Authorities could be subject to fines in the future. Similarly, bringing forward housing benefit repayments while reducing related costs, is a significant positive outcome.
8. The Capital Ambition team will bring together Croydon and BIT with interested stakeholders, utilising existing contacts and professional networks, particularly the London Environment Directors and Revenues and Benefit Managers to share the findings. In addition the Capital Ambition team will use web and social media channels to share the learning across a broader range of stakeholders.

Financial Implications for London Councils

9. The Director of Corporate Resources reports that Croydon Council was awarded a grant to fund the two trials, to a maximum of £100,000. To date £47,737 has been drawn down, with a further £52,263 available. The extent to which this has been drawn down is covered in item 4 – Director's Report.

Legal Implications for London Councils

10. There are no direct legal implications for London Councils as a result of this report.

Equalities implications for London Councils

11. There are no direct equalities implications for London Councils as a result of this report.

Recommendations

12. It is recommended that Board members:
 - a) Receive the presentation from the BI team.
 - b) Note the results of the trials, including

- c) Agree to dissemination of the results via the Capital Ambition team, through established professional networks.

Increasing recycling participation in Croydon

A report by the Behavioural Insights Team

October 2017

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Executive Summary

Introduction

In this trial, funded by the London Councils Capital Ambition Board (CAB) and conducted in partnership with Croydon Council, BIT sought to increase the uptake of Croydon's recycling programme. Household waste and recycling collection is one of the key universal services local authorities provide, and while significant progress has been made over time to increase recycling rates the national level has stagnated well below the Government's target of 50%.

Intervention

Under Croydon's household collection programme, delivered by Veolia, live data is collected on household-level participation. BIT used this unique data source to send feedback letters encouraging participation to households who had failed to put out their recycling. Based on the academic literature regarding recycling behaviour and sustainability more broadly, we tested two different letters – one focused on social impact and one focused on clarifying how and what to recycle – in a large-scale randomised controlled trial (RCT). As far as the researchers are aware, this project constitutes the largest RCT on household recycling conducted in the United Kingdom.

Results

We found that sending a feedback letter to households that failed to put out their recycling **reduces the likelihood that they will again fail to recycle in the month after by 6.2% (from 28.9% to 27.1%)**. We found these results despite a number of issues regarding trial implementation and measurement, as often occur during large trials in the field. For example, part way through the trial, Veolia, the waste management company contracted in Croydon, began using refuse trucks that no longer collected the data on who was not recycling.

We did not find significant differences between letters focused on motivation to recycle (social impact) and those focused on reducing the informational barriers to recycling (clarification), and our intervention's effect is unrelated to the level of deprivation of the area that a household is situated in. This trial should inform local authorities' efforts to improve the uptake of household recycling schemes.

Introduction

Local authorities across England are facing falling budgets and increasing demand in many service areas. In this incredibly challenging situation, innovation is required to maintain and improve services. In order to support local authorities in London to achieve this, the London Councils Capital Ambition Board (CAB) commissioned the Behavioural Insights Team to conduct a programme of projects in different policy areas across London. This programme of work was sponsored by Croydon Council, in particular its Transformation and Sustainability Team.

This report describes one of these projects: a trial focused on improving the uptake of household recycling in Croydon. This trial was delivered with Croydon Council and explored whether different behaviourally informed feedback messages could increase the number of people who participate in household recycling collection.

Structure of the Report

This report is structured as follows:

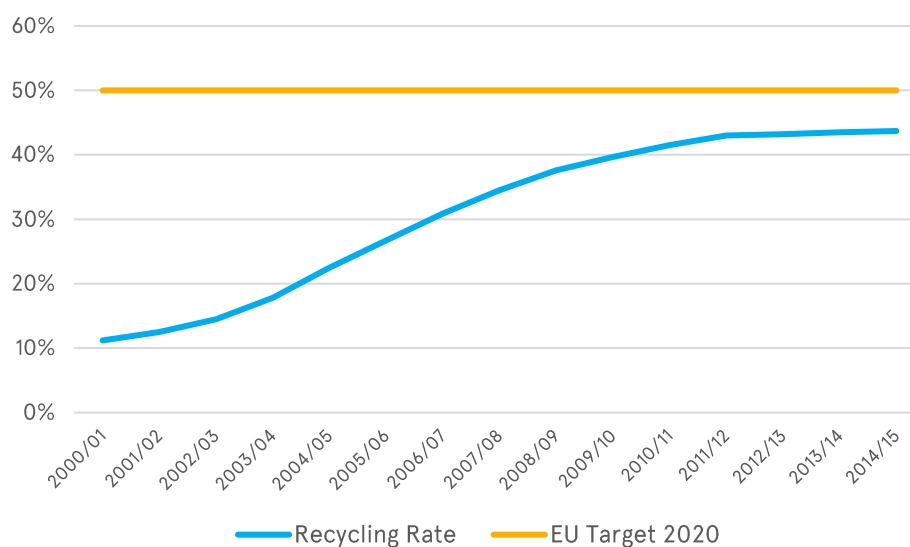
- ◆ **Background:** A description of the recycling programme in Croydon and the challenges this trial sought to address.
- ◆ **Exploratory Research:** This has two main components: a quantitative analysis of Croydon Council's recycling data to identify potential points at which to intervene to affect people's recycling behaviour, and a literature review on the relevant research regarding what works in relation to changing recycling and other behaviour related to environment and sustainability.
- ◆ **Trial:** An overview of the trial including the intervention design, implementation, and results and analysis.
- ◆ **Conclusions and lessons learned.**

Background

One of the services provided directly by local government to all citizens is waste and recycling collection. These services tend to make up significant parts of local authority spending, because of the cost of collecting from all households and because waste is subject to a landfill tax.^a The purpose of the landfill tax is to provide an incentive to pursue alternative means of dealing with waste, including reusing materials, reducing the amount of waste people generate, and increasing recycling. From a financial perspective increasing recycling is particularly beneficial, as it not only avoids the landfill tax but it can also generate income as it allows the authority to sell the recyclable materials.¹

The recycling rate in England and other parts of the UK has increased greatly since 2000. As shown in Figure 1, rates in England increased from 11% in 2000/01 to just over 43% in 2012/13. However, rates in recent years suggest that the recycling rates are plateauing short of the target level of 50% set by the Government.²

Figure 1: Household recycling rates in England.³



^a At the moment, landfill tax is £86.10/tonne of waste. See: <https://www.gov.uk/government/publications/landfill-tax-increase-in-rates/landfill-tax-increase-in-rates>

Recycling in Croydon

Recycling collection schemes differ between authorities, as each has to evaluate what methods of collection fits the area's needs and provides value for money. This depends on a number of factors, including the value of the different commodities, the ability of the nearby processing plant(s) to separate different types of recycling, and the demographic and geographic make-up of the area (e.g. how far trucks have to drive to make all collections). Most households in Croydon fall under its kerbside collection scheme, but flats and commercial properties are serviced by specifically designated collection crews. Collections for kerbside recycling in Croydon happen weekly, with a weekly collection of food waste and alternate collections of blue boxes (paper and card) and green boxes (dry mixed recycling, or DMR, which consists of glass, plastic and metal), so that each box gets collected fortnightly.^b The collection schedule for a given household under the kerbside collection scheme is shown here in Table 1:

Table 1. Overview of collection schedule for a given household in Croydon.

Type:	Landfill	Food waste	Paper and card	DMR
Bin:	Black bin	Food waste caddy	Blue box	Green box
Week 1	X	X	X	
Week 2		X		X
Week 3	X	X	X	
Week 4		X		X

Approximately 40% of the waste of Croydon's 148,099 households gets collected for recycling.⁴ However, while this rate peaked at 44.3% in 2012-13, it decreased to 39.9% in 2014-15.⁵ The target set by the Government and the EU is to recycle 50%

^b Croydon Council provides boxes for recycling, and a black bin for landfill waste.

of waste generated. This means that Croydon performed at about 10 percentage points (or 20%) below its target. The current project aimed to address this gap. It should be noted that the consequences of missing the target are not just environmental or reputational – local authorities who do not meet the target by 2020 could be financially penalised, as EU fines imposed for the missed target could be deferred to local authorities under the 2011 Localism Act.⁶ This will, of course, depend on the outcome of the Brexit negotiations.

Project Aim

The initial aim of this project was to increase the level of participation in Croydon Council's recycling scheme. This aim contributes to an overarching goal of increasing the amount of refuse that is recycled in Croydon across the three different collection services: food, paper, and dry mixed recycling (DMR, which includes plastic, glass, and metals).

As we describe in the literature review below, there have been numerous efforts to test ways to improve recycling behaviours. These often focus on one of three approaches:

1. Increasing the amount that people recycle (e.g. how many tonnes of recycling is collected in an area);
2. Increasing the participation and/or set-out rate (e.g. what proportion of people put out recycling in an area);
3. Reducing contamination (e.g. collections that contain many non-recyclable materials, which often have to be placed in landfill as sorting is not possible and/or too expensive).

These approaches are all slightly different in their focus, and the feasibility of evaluating them depends on the type of data that can be collected regarding people's recycling behaviour. In Croydon, data is collected (as part of the routine bin and box collections) about whether a household has set out its recycling that week. This is called 'lockout' data, as it captures when the crews are unable to collect from a household (for example because they are locked out of the gate). Lockout data is captured using a computer system called ECHO, which is installed on collection vehicles.

Given the availability of data that would allow us to easily measure whether the households change their participation behaviour, interventions targeted at

individual households would be feasible in this context.^c Flats, which house roughly a third of Croydon's residents, generally use communal bins for which there is no household-level lockout data. This means their recycling behaviour cannot be measured with ECHO data and so they were excluded from this trial. Instead, BIT and Croydon Council agreed to focus on increasing participation in kerbside recycling collections which covers the remaining two-thirds (approximately) of residents in Croydon.

^c This project was evaluated by measuring set-out rates, which serves as a proxy for wider participation. Where we mention participation in relation to this project, this is measured by means of the set-out rate.

Exploratory Research

To support the design of our trial and our intervention, we conducted exploratory research on recycling behaviours and the specific context in Croydon. This included:

1. **A quantitative analysis of recycling data:** To identify the baseline behaviour we sought to influence, we analysed so-called 'lockout' data gathered by collection crews at a household level.
2. **A literature review:** We completed a short review of the behavioural literature relating to recycling and environmental sustainability related behaviours.

Quantitative analysis of recycling data

We conducted quantitative analysis of ECHO recycling data to gain a better understanding of baseline recycling behaviour. Specifically, we looked at the types of missed collections (by recycling category as reason for locking out in the system) as well as how often a given household appeared. In addition, we also wanted to quantify how often a missed collection happened for a genuine reason (e.g. the resident is on holiday, the property is vacant) and when it indicates non-participation driven by behavioural factors (e.g., lack of awareness about collection day).

We analysed ECHO data for households on the kerbside recycling scheme between 1 June and 16 December 2016. This data covered refuse collections, as well as food waste, DMR, and paper recycling. Table 2 summarises these findings.

For each of the recycling categories, the total numbers of lockouts during this period were roughly similar – approximately 40,000 for food, 36,000 for DMR and 41,000 for paper. The vast majority of these (88% and higher) were locked out for not presenting recycling when their collection was due. Interestingly, only 42%–50% of these households are unique (i.e. only show up in the data once), suggesting that a sizeable chunk of households in the dataset locked out more than once within the 6 month period reviewed.

We gain a better sense of the types of households in the data by looking at the breakdown according to additional criteria (see Table 2 below): having more than 10 refuse collection lockouts (e.g. when the property is empty), locking out only once compared to multiple times (e.g. the resident may have forgotten, but does not miss recycling systematically), locking out for both recycling and refuse collection in the

same week (e.g. when the resident is on holiday). The first and last criteria account for a very small number of households. Approximately 60-66% of households only locked out once during the 6 month period, which is a sizeable number. This suggested that the remaining group of households that locked out multiple times during the 6 month period – accounting for approximately 34-40% of unique households – may not be participating in recycling in a systematic way. We decided to focus our intervention on this group as changing their behaviour would have the greatest impact on the total amount of recycling.

Table 2: Lockout data between 1/6/2016-16/12/2016	Food	DMR	Paper
Full sample (full count)	40393	35907	41270
Locked out for not presented/nothing found	38692	33213	36286
Unique households	16916	17835	18559
Unique households (% of full sample)	41.87%	49.67%	44.97%
Excluding households with >10 refuse lockouts	16906	17828	18545
Excluding households with one recycling lockout	7136	6057	6701
Excluding households locked out on both recycling + landfill	6968	6049	6405
Final Number of Lockouts in Baseline	6968	6049	6405

We used these baseline figures to determine how many letters we would need to send to be able to confidently detect any change in behaviour.

Literature Review

As part of the exploratory work related to this project, BIT conducted a review of the academic literature related to recycling. This review, which we include below, helped inform the focus and design of the intervention by helping us understand what specific behavioural approaches were most likely to work. Although ultimately the focus of this trial was on increasing participation rates in recycling collection programmes, this broader collection of evidence regarding recycling and related behaviours provides a more solid and holistic understanding of the issue from which we can build interventions that are most likely to be both feasible and effective.

Introduction

This literature review gives an overview of the existing evidence from behavioural science research on increasing recycling participation and reducing recycling contamination. It first outlines the context of recycling in the UK, with a particular focus on Croydon. It then identifies behavioural barriers to effective recycling, before discussing potential interventions based on what has been successful in changing recycling behaviour elsewhere, as well as in related settings, such as energy conservation.

The barriers to effective recycling are divided into three overarching categories:

1. Structural barriers e.g. limited access to recycling collection
2. Informational barriers e.g. lacking information about what can be recycled
3. Motivational barriers e.g. not believing recycling as a positive impact

In turn, the evidence for effective interventions which aim to overcome these barriers are reviewed under these three categories:

1. Structural interventions e.g. making recycling easier by introducing collection from people's houses (domestic recycling)
2. Informational interventions e.g. providing information leaflets
3. Motivational interventions e.g. showing people the outcomes of their recycling behaviours

Finally, we assess which interventions appear to be the most effective and conclude with some key factors we believe to be important for future trials to improve recycling participation and reduce contamination.

Methodology

This review seeks to address two questions:

1. What evidence is there amongst existing literature on increasing recycling participation and reducing contamination, and
2. Where there is a lack of robust evidence specific to recycling behaviours, what transferable evidence from other contexts can contribute to our understanding of these issues?

A database search was conducted in JSTOR and Google Scholar for terms related to recycling. We also received suggestions for literature to review from two leading academics in the field – Prof. Ayelet Gneezy (from University of California, San Diego) and Prof. Elizabeth Keenan (from Harvard Business School).

Barriers to Effective Recycling

In this report we group the barriers to recycling into three broad categories:

1. **Structural barriers** around the logistics of the recycling programme in place, or the availability of and access to bins (e.g. people who have limited access to recycling collection)
2. **Informational barriers** involve a lack of knowledge of the benefits or impacts of recycling, of what can be recycled, or of the recycling programme in one's local authority (e.g. people may not know what can be recycled under their local area's recycling programme)
3. **Motivational barriers** cover incentives to recycle, social norms, or not having an environmentally friendly attitude (e.g. people may not believe recycling has a positive impact)

These three groups allow us to discuss the interventions that have been tested in the past in a structured manner. For example, if a marketing campaign successfully increases a resident's awareness of what to recycle (informational), we would expect the recycling rate to increase. Likewise, providing free bin liners provide a solution to a structural barrier that residents may face.

It is important to note that the categories are not entirely separate levers and may be interlinked in obvious and less obvious ways. For example, a monetary incentive to recycle (e.g., a chance to win shopping vouchers if one's neighbourhood recycles most in the borough) could increase a resident's motivation to recycle, and may encourage them to seek out information about recycling, thereby addressing two barriers at once. It is also possible that the reward encourages a resident to seek

out information about recycling, but may decrease overall motivation to recycle once the rewards are no longer on offer.

As such, while these categories are useful tools to structure the available evidence on increasing recycling participation, they should be considered as part of a system rather than as independent silos. In addition, the importance of each category should be based on an understanding of the local context.

Structural barriers

Structural barriers are those relating to existing tangible systems that prevent or do not encourage positive behaviour towards recycling. Examples of structural barriers include poor recycling collection coverage in an area or inefficient design and/or capacity of bins. Research has found that structural barriers often have significant impact on recycling rates.

The Waste and Resources Action Programme (WRAP) is an independent, not-for-profit organisation that is the principal delivery body of the Department for Environment, Food and Rural Affairs (Defra) for the provision of advice, technical and financial support on waste reduction and resource efficiency in England. It has conducted extensive research into the factors affecting domestic recycling behaviours. WRAP identifies three kinds of structural barriers that have a significant impact on recycling behaviour:

1. The range of materials targeted by a local authority: the more materials that can be included in recycling, the higher the recycling rate;
2. The characteristics of the domestic collection system: recycling rates are higher in areas where households are limited in their waste capacity (for example because waste only gets collected every other week) and are provided with large enough containers for recycling.
3. Socio-economic status: lower levels of deprivation correlate with higher levels of recycling.⁷

Structural barriers are important determinants of recycling performance and they do not always have to be very costly to change. Even small changes to people's environment to make recycling easier can have a disproportionately large effect.⁸

Informational barriers

Past interventions to improve recycling in an area have often focused on informational barriers. This covers a lack of awareness of local recycling

programmes, poor knowledge of what can be recycled, a lack of understanding of how recycling works, and missing information on the benefits of recycling (as opposed to putting items in refuse). For example, a report by WRAP finds that four in five households report being unsure about whether, or where, certain materials can be recycled.⁹ The report suggests that uncertainty reduces confidence about what can and cannot be recycled, and as confidence in recycling decreases so do levels of recycling. Research has found that tackling this barrier through educational programmes or awareness campaigns can slightly increase recycling take-up or reduce contamination.¹⁰ However, there are some important limitations to this which relate to motivation to recycle, which we will discuss in more detail below.

Motivational barriers

Even if the infrastructure for recycling is established, and the information on how to recycle is available and known, there may still be barriers relating to people's motivation. The incentives of recycling are problematic because the costs of doing so are borne by each individual, yet the benefits of saving the local council money, curbing climate change and creating a clean community are shared by all residents, irrespective of whether they participate in recycling or not. In addition, individuals typically do not see or hear about the benefits their behaviour contributes to the public good. This issue, which is common to many environmental challenges, means that motivation to participate is often lower than it should be. Indeed, one of the key motivational barriers to recycling, for example, is that people do not believe there is an environmental or community benefit to recycling.¹¹ There is a small cost to the recycling 'user', as they have to expend some mental effort to recycle. If there is no perceived benefit, whether that be tangible such as a cash reward, or more conceptual such as fulfilling a duty, recycling is unlikely. As is the case in analogous policy areas, research has shown that providing monetary rewards or punishment to address the issue can increase motivation to participate in recycling and reducing contamination.¹² However, non-monetary motivators, such as trust, reciprocity and social pressure are also effective in changing public good contributions¹³. We will discuss this, among a number of approaches to overcome motivational barriers, below.

Evaluating behavioural interventions

There are a number of behavioural interventions that have been successful in overcoming or mitigating some of the above barriers, both in the context of recycling and in other areas.¹⁴ Conducting rigorous research evaluating the impact

of interventions on recycling behaviours has proven difficult, and the quality of the research on recycling behaviours is less rigorous than in other fields such as health behaviours. Recycling behaviour is particularly difficult to track because it often involves a behaviour that is demonstrated in private, its long term benefits rely on continuous engagement, and there is a public norm that recycling is 'good' which can influence, for example, how honest people are in surveys. In addition, it is logistically challenging to do studies on recycling volumes by individual, as the collection vehicles generally do not allow for a way to determine how much a household recycles (e.g. by weighing individual receptacles). Even studies at the household-level, which are resource intensive to run but more accurate, have to make assumptions about how the behaviours within a household contribute to the household's total recycling 'output'.

We aim here to combine the best available research on recycling with more rigorous studies in the field of energy conservation (where many of these barriers do not apply) to provide the fullest possible picture. In this section, we discuss a selection of the most promising and best quality evidence and the context of how it could be applied to increase recycling participation and reduce contamination in Croydon.

Structural interventions

Making it easy to complete a positive behaviour is a core component of many behavioural interventions, and the same is true for those in the field of recycling. Below we outline a series of interventions that have attempted to make recycling easy.

Increasing the capacity and frequency of refuse collection

WRAP has found that one of the most influential actions local authorities can take to improve recycling rates is to decrease the capacity and frequency of refuse collection, and increase the dry recycling containment capacity. On the other hand, when local authorities increase the size of containers for landfill waste, recycling rates decline.¹⁵

These insights are supported by academic research, although a limited number of studies have been conducted in this area. A study in Germany evaluated the impact of a local authority introducing domestic collection, where people previously had to drop-off their recycling.¹⁶ The authors conducted surveys to assess attitudes and to determine how frequently respondents recycled. The impact of reported

attitudes had a moderate effect on recycling participation, but the impact of introducing domestic collection was much larger (for DMR, it was five times larger). The introduction of domestic recycling collections is one of the most potent examples of making behaviour easier, and similar impacts on recycling have been observed as domestic recycling was introduced in the UK.¹⁷

Interventions adjusting smaller structural factors to make environment-friendly behaviours easier also tend to find positive results. A World Bank study in Peru, which tested a number of interventions in a large scale randomised controlled trial (RCT), where groups of randomly selected households received different messages and some groups of households were randomly selected to receive recycling bins (some with stickers on them encouraging recycling, some without). The researchers found that providing people with a recycling bin (with or without sticker) had a significant and positive effect on both the frequency and the amount of recycling. Other interventions, such as SMS reminders and environmental messages to improve participation, also had a positive effect, but these were not statistically significant. Due to a low number of observations the study could only detect differences in recycling rates of 5 percentage points or greater.¹⁸ A field experiment with a control group comparison found that people who were provided specialised recycling bags (in combination with some persuasive communication) were four times more likely to recycle than the control group who received no treatment (12% compared to 3%).¹⁹ It must be noted that this study took place in 1991 when recycling was much less widespread, and that the persuasive message likely also influenced behaviour.

Changing the default

Other effective structural changes, such as changing defaults, have been found in the area of energy conservation. A change in Rutgers University's printing default, from 'single page' to 'double sided', brought about a 47% reduction in the number of sheets of paper used.²⁰ At a large Swedish university, the same default change brought about a 15% drop in paper consumption which remained stable over time.²¹ A field experiment in Germany, where two areas' local energy suppliers started to default users into receiving green energy plans, found that very few people switched away from these defaults.²² While defaults for recycling behaviour are less obvious, the gains made by adjusting defaults in areas of energy conservation demonstrate the power of this approach.

Prompts and reminders

A final structural approach to improving recycling rates is to use prompts and reminders. A large RCT in Surrey tested whether or not stickers on the lid of refuse bins could prompt people to separate out food waste for recycling (instead of placing everything in the refuse bin).²³ The stickers read, in large letters, “No Food Waste Please. Remember to use your food recycling caddy” (see Figure 2).

Figure 2: Sticker prompts used by Shearer et al.²⁴



While the control group saw no significant change in the food waste collected on a weekly basis, the treatment group saw a 20.74% increase in the weekly tonnage (from 1.23 tonnes to 1.49 tonnes).

Informational interventions

Providing information is an important precursor for positive behaviours, as people need to know what they should do and how they should do it. A range of different interventions have aimed at increasing participation rates by addressing informational barriers.

Doorstepping campaigns

A small RCT in Trafford (Greater Manchester) evaluated the efficacy of a direct approach to spreading information door-to-door by canvassers trained to promote and encourage recycling. They found an increase in participation rates by 5.4 percentage points in comparison to the control group.²⁵ Specifically, the participation rate in the treatment group increased from 47.7% to 52% immediately after the intervention. The effect was largest for streets with low baseline levels of

recycling. However, the effects reduced over time, which could suggest that the intervention did not change people's long-term recycling habits.

It should be noted that the above intervention involved a lot of engagement with the participating households, and that graduate students analysed the quality of recycling by inspecting bins when they were put outside for collection. It is likely that participants knew they were subjects of the study, and that they adjusted their behaviour in part because they knew they were being observed. For example, a study that sent people weekly postcards to tell them they were part of a study about electricity use and that no further action was required found a 2.7% reduction in monthly energy consumption.²⁶

Research in Manchester using a door-to-door campaign achieved a 7.2% increase in domestic recycling participation.²⁷ On the other hand, a study in Portsmouth found that an informational door-to-door campaign focused on increasing participation and reducing contamination actually decreased participation by 3.8 percentage points (from 61% to 57.2%), while not affecting contamination rates at all.²⁸ One possible explanation behind these different effects is the specific neighbourhoods in which the doorstepping took place. For example, the study in Manchester was conducted in an area with a good recycling service and many terraced and semi-detached houses that are easy to contact.

While the increased participation seems promising, the evidence of the effectiveness of doorstepping campaigns is mixed. It is a resource- and time-intensive approach that can increase participation rates in the short-term, but this effect may diminish over time. It therefore remains unclear how well these campaigns could be replicated or scaled, and what effects they would have.

School-based campaigns

School-based awareness campaigns provide contradicting evidence to the findings from doorstepping. One school-based intervention in North West England tested two types of class-based instruction on environmental issues, one long and the other short, that were designed to increase environmental awareness.²⁹ Environmental attitudes and behaviours were measured by surveys completed by the students in their classes and in their homes before and after the interventions. Despite the time spent on improving awareness, there was no statistically significant

difference in attitudes among students between schools in the intervention groups compared to the control group schools.

Fresh start effects

Some research proposes that changes in households' recycling behaviour are often the result of changes in occupants, or of bins going missing, rather than changes in recycling habits of individuals.³⁰ This has implications for areas with high levels of transient populations, as new occupants seem less likely to recycle (in part because they are unfamiliar with the local area's recycling programme). However, transient populations also provide an opportunity; the move to a new home can function as a 'fresh start'. Research on the effect of important times of (perceived) change, such as birthdays, New Year's, and moving house, show that these moments often correspond to changes in repeated behaviours, such as exercise or dieting.³¹ While there has not been extensive work on the impact of targeting new residents in improving recycling, targeting new arrivals in an area designed around the concept of a 'fresh start' could be a promising area for intervention. New residents are already contacted by the local authority, and such established touch-points may enable a behaviourally informed RCT.

Performance-based feedback

One informational approach that has been used in a number of studies is providing feedback on performance. Feedback is crucial in learning processes, and without receiving feedback people who do not exhibit positive behaviours may not even be aware that their behaviour is suboptimal. Feedback has been tested extensively in the field of energy conservation, where it is generally found to have a small positive effect. Two large field RCTs evaluated the impact of 'Home Energy Reports' by the energy provider Opower.³² These reports contain personalised feedback at the household-level (comparing current usage to historical usage), social comparisons, and energy conservation information (see Figure 3 for an example). Both studies found small significant reductions (1.2% to 2.1% depending on area in one study).³³ This is supported by a large review of feedback studies which found that the more robust studies reported reductions in consumption of about 2%.³⁴

Figure 3: Opower Home Energy Report³⁵



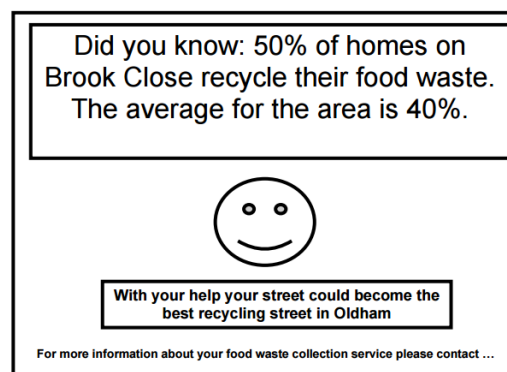
A meta-review of studies using feedback found that feedback works much better if it is provided in an interactive format (such as a computer-based platform), and that goal-based comparisons tend to be more effective than social or historical comparisons.³⁶ A trial in Switzerland, for example, found a 22% reduction in water usage from showers after households attached a water-meter on the shower that showed real-time feedback.³⁷ People saw their water consumption increase each second, accompanied by a picture of a polar bear on a melting slab of ice to indicate how they were affecting the environment. Notably, this decrease occurred with the first provision of feedback and persisted over time.

Due to the scale of the Opower studies mentioned above, and the granularity of the data, they could detect two interesting mechanisms. First of all, consumption feedback to the highest performers (i.e., the households that used the least energy) actually led to an increase in their energy usage – a so-called ‘boomerang effect’.³⁸ And secondly, the intermittent feedback (which was sent monthly or quarterly) led to ‘backsliding’ over time: households reduced their consumption after receiving feedback, but their consumption started to increase slightly over time (until the next feedback report was received).³⁹ This suggests, for example, that social comparison feedback should not be provided to the ‘best’ performers, and that feedback interventions may need to repeat the feedback to remain effective over time.

Food waste collection is increasingly being offered by local authorities, as one of the categories of recycling. The impact of interventions focused on food waste has traditionally been hard to measure, partly because there is a lack of data around the amount of food waste in landfill pre- and post-intervention, and a lack of data

on how much food waste gets composted by households.⁴⁰ An RCT in Greater Manchester tried to increase food waste disposal by sending the treatment group two postcards with feedback on their street's food waste recycling performance compared with the average for their neighbourhood.⁴¹ The postcards contained information about the participation rate in each street and how it compared to the average in the area, as well as a smiling face or frowning face icon (see Figure 4). On the back of the postcard was information about recycling food waste. This feedback increased participation in the local food waste recycling scheme by 2 percentage points (48.1% to 50.1%) after the second postcard, which was significant compared to the control group.

Figure 4: Area-based feedback card used by Nomura et al.⁴²



Feedback can not only increase participation rates, but can also help improve performance. For example, another study in the UK found that providing feedback cards was a highly cost-effective means of reducing contamination.⁴³ Among the feedback group, contamination reduced by 48% (from 36.1% to 18.9%). However, the participation rate in this group was not significantly different.

Feedback interventions have repeatedly shown positive effects, although the effect size of feedback can be low. Feedback targeted to specific behaviours, in an interactive format, in a timely manner (i.e. timed in a way that maximises the likelihood of an impact on behaviour), and with a clear goal to aim for seems to be most effective. However, the more rigorous work on feedback finds relatively low effect sizes and there is a potential for backfiring, which has caused some scholars to warn against relying too heavily on this approach.⁴⁴ Feedback alone is not enough, although it can be helpful when used well. To remedy some of the adverse behavioural effects, social comparison feedback should not be provided to the

highest performers, and repeated feedback (perhaps paired with reminders) can reduce the tendency for poor recycling behaviours to relapse.

Motivational interventions

In addition to structural factors and a lack of information, it is possible that recycling rates are low simply because people lack motivation. This can be due to a variety of reasons, and is likely to be intertwined with informational factors. For example, if someone does not know what items are (or can be) made from recycled materials, the benefits of recycling may be less salient to them. Common motivators that have been studied are environmental attitudes, incentives, and social norms. In this section, we describe a number of behavioural approaches that have been tested to increase motivation to recycle, and eventually actual recycling behaviour.

Attitudes and Self-Reporting

A number of studies have used surveys, or other self-reported measures, to measure people's attitudes to recycling behaviour. In most cases, the effect of interventions on attitudes is limited. For example, a letter-based trial in the London Borough of Havering sent people leaflets with critical, neutral, or encouraging messages on recycling to change attitudes.⁴⁵ The study found no significant effect in attitudes between recipients of the different messages. A study in Germany found that the introduction of a domestic recycling programme had a much larger impact on recycling behaviour than on individuals' attitudes.⁴⁶

This suggests that pro-environmental attitudes are not important in the face of structural barriers, but it may also highlight an issue with the survey methodology: that attitudinal measures towards recycling and other environmental behaviours do not seem to be a good proxy for actual behaviour.⁴⁷ For example, research in Australia testing the impact of people's self-identity as 'a recycler' found a significant impact upon recycling intentions, but not on actual recycling behaviour.⁴⁸ One mechanism that contributes to this attitude-action gap could be social desirability bias – the tendency to over-report positive behaviours and under-report negative ones (such as in surveys and interviews).⁴⁹ This means self-reported measures cannot normally be taken at face value. Unfortunately, this reduces the amount of strong evidence supporting approaches to improved recycling based on changing attitudes, as many of the studies in this field rely on self-reported measures (of attitudes and behaviour).

While changing attitudes towards being more environmentally friendly does not seem to correlate well with changes in recycling behaviour, there may be a role for commitment devices in changing recycling behaviour. One study in New Zealand sent households educational and promotional information specifically designed to maximize participation in a recycling programme. Some households were asked to verbally commit to the programme in addition to receiving the information. The verbal commitment intervention significantly increased participation relative to the no-commitment intervention.⁵⁰

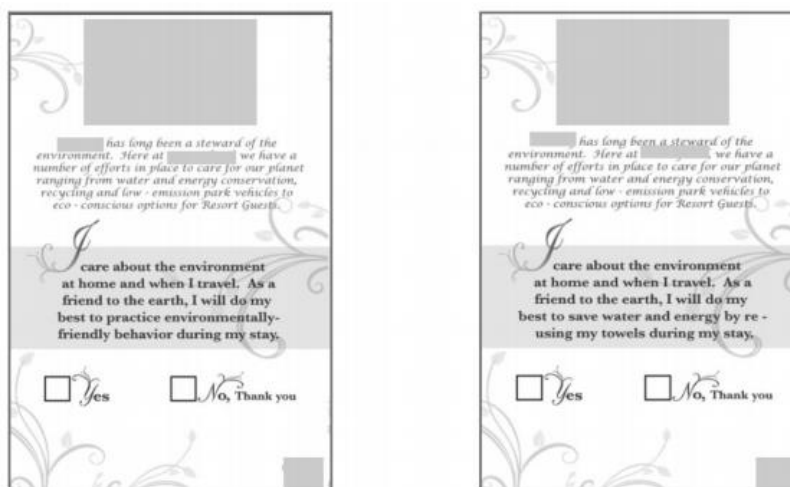
Social Norms

Leveraging social norms has also been found to be successful in promoting desired behaviours in a range of settings.⁵¹ There is evidence to suggest that they could be a useful tool in increasing recycling participation rates as well. A small RCT in La Verne, California, tested the effect of placing personal feedback messages (stating the amount of each material collected at the house the previous week, the current week, and the cumulative over the course of the study), as well as group, social norms feedback messages (stating the same information as the personal feedback condition, as well as the percentage of households that participated that week) on door hangers in single-family dwellings.⁵² The results showed a significant increase in participation among those receiving the norms message (from 42% to 50%), as well as an increase in the total amount recycled. Their other intervention arm, providing individual feedback, saw similar results (from 43% to 49%). Another study in the United States that tested whether social norm messages (“the majority of guests reuse their towels”) significantly increased the rate at which guests reused their towels compared to the hotel’s standard environmental message.⁵³ The social norm condition increased towel reuse rates from 35% to 44%, suggesting that social norms play a powerful role in influencing our behaviour.

Reciprocity and Commitment

Interventions that increase motivation via reciprocity and public commitment have also been found to be effective in resource conservation. An RCT in Orange County, California, tested whether this could motivate people to reuse towels in their hotel rooms.⁵⁴ Upon check-in, guests in the treatment group were given the option to join the hotel’s environmental campaign by committing to be environmentally friendly during their stay, either through a general commitment (“I will be environmentally friendly”) or through a specific one (“I will reuse my towel”) (Figure 5).

Figure 5: General (left) vs. Specific (right) commitment.⁵⁵



The authors found that guests who made a specific commitment were more likely to reuse a towel compared to the general commitment arm (66.6% vs. 61%), and the guests who received a pin they could wear to show their commitment were more likely to reuse a towel than those who did not receive one (68% vs. 59.6%).

There have been a number of programmes in the UK that have used reciprocity to encourage recycling, by giving individuals something in return for increased participation. One such programme is run by GreenRedeem – a company that partners with local councils to provide households with a points-based reward scheme, similar to retail reward cards, where people recycling to earn points that can be redeemed at local shops and service providers. The Royal Borough of Windsor and Maidenhead rolled out GreenRedeem in 2010, and according to GreenRedeem this intervention has seen recycling improvements year on year – from 34% in 2009/10 to 48% in 2012/13.⁵⁶ However, other changes were made at the same time and therefore it is difficult to attribute this success to the scheme.

Incentives

In addition to providing small incentives to create a sense of reciprocity, it is of course possible to simply provide incentives for positive behaviour. Behavioural scientists often propose applying incentives through lotteries, where a large prize (or multiple smaller prizes) are awarded to a small number of participating households. Lotteries have been successful in increasing tax compliance⁵⁷ and helping people stick with diet programmes.⁵⁸ A study conducted in Portsmouth that

used a lottery to try and increase recycling found that, compared to door-to-door campaigns and providing feedback, lottery incentives (valued at roughly £25) were the most effective.⁵⁹ In their lottery project, the incentivised treatment group saw an increase in recycling participation of 5 percentage points (69.9% to 74.9%), and a reduction in contamination of almost 52% (from 60.3% to 29.1%).

All the interventions so far have used positive approaches to try and increase recycling. An alternative approach is to directly impose a tax on waste, or another form of financial penalty for non-participation or poor quality recycling. Penalties may be disproportionately effective because they leverage people's sensitivity to losses – where people weigh losses heavier than equivalent gains.⁶⁰ One study in Vaud, Switzerland, found that charging residents per bag of rubbish led to a 40% reduction in unsorted waste, with no negative spillovers on adjacent regions.⁶¹ The study also found that people are willing to support a 70% higher tax on waste after the programme was introduced compared to before the new charging structure. The study suggests that taxing waste can generate up to 36% of waste management costs.

Another approach that leveraged loss aversion, but through non-monetary incentives, was taken in an energy conservation trial. Researchers provided energy consumers in a housing community in Los Angeles, California, with real-time access to their usage information, and attached the monetary cost in one treatment arm and environmental and health impacts in another (including listings of the conditions tied to emissions, such as childhood asthma and cancer).⁶² While households receiving monetary information slightly increased their energy consumption, households receiving messages that emphasized air pollution and health impacts associated with energy use reduced their consumption by 8.2% on average. The effects for that group were largest among the worst polluters, with a 15.5% reduction among the 10% heaviest users.

Messenger Effects

Relying on messages coming from peers rather than from authorities could have positive effects on recycling behaviour, because the manner in which a message is delivered and who delivers it can shape an individual's response.⁶³ One study in Claremont, California, sought to increase participation in a city-sponsored domestic recycling program by leveraging peer networks. Citizens who consistently recycled with the city program were approached and asked to be "recycling block

leaders.”⁶⁴ Those who agreed were instructed to give approximately ten non-recycling neighbours a persuasive communication advocating recycling and special recycling bags. While the bags and communication increased weekly recycling rates from 3% in the control group to 12%, the use of these peer “block leaders” (who recruited their neighbours) increased it to 28%. As the bags and the leaflets were provided in both treatment conditions, this suggests that the messengers further increased the impact.

Literature Review Summary

This review of the existing literature identifies many interventions that have proved to be effective in different settings across the world. Whilst it is important to tailor any new interventions to the specific setting they are being implemented in, learnings from these previous studies help us to determine what may or may not be effective.

Based on the above assessment of the literature, two factors are identified as important for increasing recycling participation and reducing recycling contamination:

1. Make recycling as easy as possible – This includes providing people with the bins that they need (ideally free of charge), prompting people to recycle, and collecting recycling outside their house.
2. Provide feedback – Where possible, provide feedback on an individual basis (i.e. by feeding back on the performance of your household rather than your whole neighbourhood). Feedback should be as timely and personalised as possible to maximise the impact.

Interventions that combine these aspects have the best chance of significantly improving recycling participation and reducing contamination without requiring significant additional resources from local authorities. We believe that there is much promise in approaches that make recycling easier, as well as in providing incentives for recycling. However, these two options would require more investment on the part of local authorities. For this reason we recommended first evaluating the effects of low-cost interventions by giving timely and personalised feedback. This feedback, provided via letter, was supported by either social impact messages (to make recycling more attractive) or clarification messages (to lower the barriers to recycling).

Trial – Sending feedback letters to residents who fail to put out their recycling

In this project, BIT designed and implemented a behaviourally informed feedback letter intervention designed to encourage residents in Croydon to increase the participation rate in the household recycling collection programme.

In this section, we begin by describing the intervention design and the reasoning behind it. We then briefly discuss the trial design and the implementation of the interventions, highlight a number of issues that arose during the implementation, and describe how the trial was adapted to overcome these issues. Finally, we summarise the results from our analysis.

Intervention Design

As evidenced in the literature review earlier in this report, findings across multiple studies suggest that recycling should be made as easy as possible. This includes providing people with the bins that they need (ideally free of charge, so that there are not financial barriers to people having the bins they need), prompting people to recycle the day or evening before their collection is due, and collecting recycling at the kerbside. Such interventions, which mostly address logistical challenges to recycling, have the strongest impact on recycling behaviours. However, these more structural interventions tend to be expensive and intensive, and given constraints on time and money it was not possible to use this route in this project.

Before the start of this trial, Croydon's residents received some communication regarding their recycling collections, most notably a flier including information about what to recycle and how to do so. However, many of the individuals BIT spoke to during the fieldwork of this project reported not seeing this flier, nor other information (such as the recycling calendar and accompanying information that Croydon produces and distributes to residents every year). Moreover, many admitted they did not have a clear sense of what happened to their recycling once it was collected, and BIT heard several anecdotes from residents suggesting that there was scepticism about the impact of the recycling programme. For example, one resident raised a concern that with the construction of an incinerator in South London, there would be an incentive to "keep it burning" – even if this would require burning recyclable materials.

There is a lot of potential in providing feedback on recycling behaviours, insofar as this is possible on an individual or household level basis (as opposed to, say, street or neighbourhood level). Feedback about recycling behaviour should be provided in a timely manner (i.e. not too long after someone failed to recycle properly), and should be individualised where possible (e.g. by addressing households rather than streets or neighbourhoods) to maximise the impact.

Veolia gathers data on Croydon Council's behalf about which households put out their recycling on a weekly basis, and this up-to-date information allowed for a unique approach of providing personalised, household-level feedback – that is, we could send feedback information to individual households about the fact that they had not put their recycling out in a particular week. For this trial, BIT decided to send out letters to households who missed a recycling collection, noting that they had not put their recycling out the previous week. In addition to overcoming some of the barriers to engagement described above, sending out this feedback information could leverage the Hawthorne effect – the fact that people tend to behave differently when they think someone is watching them.⁶⁵

Again, as covered in the literature review in this report, research has looked at how behaviour can be changed by providing people with more information, as well as what methods are effective in motivating people to recycle more. These approaches are based on two potential explanations the underlie people's recycling behaviour:

1. Recycling behaviours are imperfect because people do not have the required information to recycle properly. (According to the Local Government Association (LGA), for example, there is "widespread confusion" about what can be recycled in different local authorities)⁶⁶
2. Recycling behaviours are imperfect because people are not motivated to recycle (or at least not motivated enough to overcome the friction costs – small barriers that mean behaviours require a bit more effort).

Both of these explanations are likely to contribute to recycling, but it is unclear which should be targeted and used as a 'lever' in order to increase participation. This trial represented an opportunity to investigate which lever would be more effective in increasing recycling behaviour – providing information about recycling, or attempting to change motivation to recycle.

After our review of the literature, BIT solicited the expertise of two academics who have worked on environmental and recycling behaviours before: Professor Ayelet Gneezy at the University of California in San Diego (UCSD), and Dr Oliver Hauser at Harvard Business School (HBS). BIT's conversations with these researchers helped narrow down which interventions would be most likely to be successful and refine the approaches to providing information on how to recycle or increasing motivation to recycle. Ultimately, it was decided that the content of the letters to be sent out to Croydon households would include feedback about the household not having put their recycling out, and the letters would also contain one of two additional approaches to changing behaviour:

1. Providing information to clarify what can be recycled and how – this approach was termed the **clarification condition**.
2. Aiming to improve motivation to recycle by reminding people of the benefits of recycling to their community – this approach was termed the **social impact condition**.

These two approaches are called our “treatment” conditions. This is the terminology applied in RCTs when a group of people involved in the trial are “treated” using the new approach or process that is being tested.

The letter for the clarification treatment condition was designed to help reduce friction costs by providing the recycling collection day for each household. In addition, it gave easy-to-follow guidance about what can be recycled (divided by each type of collection), as well as about how to order a new recycling box free of charge.

For the letter looking to have an impact of people's motivation to recycle, BIT initially investigated whether we could motivate people on an individual basis to take part in the household recycling programme, for example by leveraging their environmental attitudes (if they have any) or by highlighting individual benefits to recycling. However, since it was not possible to provide people with incentives or to impose sanctions on households not participating in recycling, it was difficult to make a strong case that there was an individual benefit to recycling. Instead, a community-level social impact message was found to be the best option for this treatment condition.

In addition to the treatment groups, which received the two different letters described above, one third of the people who 'locked out' were placed in our

control group. By comparing treatment groups to a control group, who received the same treatment as they would have if there was no trial going on (business as usual), we can see what the effect of the interventions was. In the case of this trial, the control group did not receive any communication from Croydon Council (as the Council was not sending any before we introduced the letters). Comparing treatment and control groups which have been randomly assigned (to make sure they are as similar as possible and differences are not the result of, say, one group being much richer or younger on average than the other), is the cornerstone of RCTs. This method provides the most rigorous evaluation, because it limits the other factors that could influence differences (including time trends).

By comparing out treatment conditions to a control condition, we would learn whether these treatment approaches have been effective in changing the number of people participating in recycling in Croydon. A comparison between our treatment conditions, in addition, could provide some insight into whether low participation is likely to be the result of limited information (or high uncertainty), or rather because of limited motivation, and therefore we would gain insight into what sort of approaches Croydon Council might focus on in the future and beyond this project to further efforts to change recycling behaviour.

The information we wanted to include in the letters was specific to the different recycling rounds (food, DMR, and paper). For example, we wanted to clarify what items to recycle in each, and the collections for food waste were weekly while the other ones were fortnightly. For this reason, we changed the wording of the letters based on the type of recycling a household was locked out for. We had two letter 'skeletons' – one for each treatment condition – and filled these skeletons with messages appropriate for the type of recycling a household had missed. Most notably, the variation occurred in the middle of the letter (in a text box with three components).

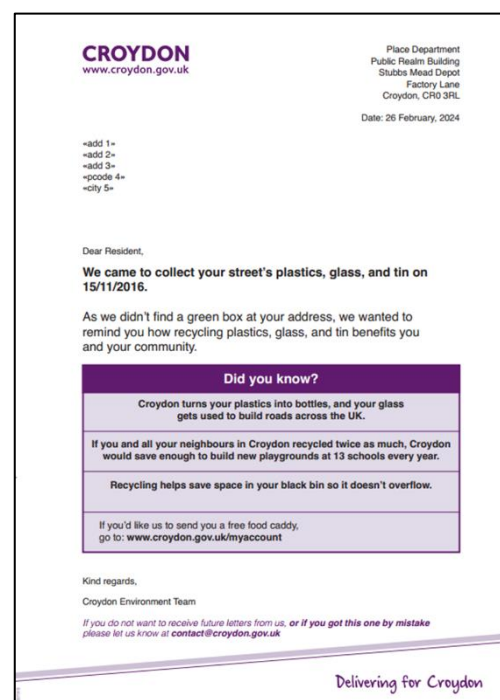


Figure 6: Example of the social impact letter related to DMR.

The treatment conditions are provided in Table 3, below (see Figure 6 and Annex 2 for examples of the letters). Note that the content of the letter is slightly different depending on whether it refers to food waste, paper, or DMR recycling (the table below contains the unique messages for each type, by condition).

Table 3: Message components for each letter, by condition

Clarification Condition <i>Each letter contained three message components providing information aiming to clarify how to recycle (below)</i>			
Letter type to be sent to household	Message component 1	Message component 2	Message component 3
Letter about recycling food waste	All food can go into your caddy, even teabags, chicken bones, and vegetable peelings.	If you run out of biodegradable bags, you can line your food waste caddy with old newspapers. You can also buy more bags at your local grocery store.	Recycling helps save space in your black bin so it doesn't overflow.
Letter about recycling paper	These can always be recycled: cardboard boxes, newspapers and flyers.	Cardboard boxes can be torn up so they don't take up as much space	Recycling helps save space in your black bin so it doesn't overflow.
Letter about recycling DMR	Cans, bottles (plastic and glass), and milk or juice cartons can all be recycled.	All glassware can go into recycling, just be sure to rinse it out sticky bottles and jars.	Recycling helps save space in your black bin so it doesn't overflow.

Social Impact Condition

Each letter contained three message components aiming to have an impact on people's motivation to recycle by explaining the social impact of recycling (below)

Letter type to be sent to household	Message component 1	Message component 2	Message component 3
Letter about recycling food waste	Food waste is used as fertiliser by farmers to grow crops.	If you and all your neighbours in Croydon recycled twice as much, Croydon would save enough to build new playgrounds at 13 schools every year.	Recycling helps save space in your black bin so it doesn't overflow.
Letter about recycling paper	Croydon turns your paper recycling into cardboard boxes that are used across the UK.	If you and all your neighbours in Croydon recycled twice as much, Croydon would save enough to build new playgrounds at 13 schools every year.	Recycling helps save space in your black bin so it doesn't overflow.
Letter about recycling DMR	Croydon turns your plastics into bottles, and your glass gets used to build roads across the UK.	If you and all your neighbours in Croydon recycled twice as much, Croydon would save enough to build new playgrounds at 13 schools every year.	Recycling helps save space in your black bin so it doesn't overflow.

Outcome Measures

For this trial, we looked at the number of households that fail to participate in Croydon Council's recycling programme. On collection vehicles, Veolia has installed the digital ECHO system on which crews can indicate when they are unable to collect a certain bin or box from a household. This is referred to as a 'lock out'. To implement the intervention and evaluate its impact BIT, used Veolia's ECHO system lockout data. When a household is locked out in the system, a note is made of the reason for not collecting that box. This reason can vary, and options on the system include things like "Contaminated", for when a recycling collection contains a significant number of materials that should not be recycled, or "Dog in Yard".

Most of the available categories are rarely used. The most common categories – "Not Presented" and "Nothing Found" – are entered when the bin or box that should have been put out on that day is not found (or not accessible to the collection crew). These make up the vast majority of lock-outs – roughly 70%. (It's worth noting that while these two category names were originally devised to indicate different problems, our fieldwork shadowing collection crews and observing how they use the system suggested that they are used interchangeably in practice.)

Since the focus of the trial was on increasing participation in the recycling programme, we targeted households that were locked out in the system under "Not Presented" or "Nothing Found". These households were contacted via letters approximately 1 week after being entered into the ECHO system. Households received the letters towards the end of the week, and to ensure each had sufficient time to read the letter we delayed measurement by one further week. We then monitor whether the household locked out again during the following 4 weeks. During the measurement period, we looked at whether a household reappears in the ECHO system as well as the number of times a household reappears.

To maximise the value for Croydon Council, a local authority with significant differences in levels of deprivation across the Borough, we also conducted secondary analysis by postcode-level deprivation index. This analysis investigated whether one of the letters was more or less effective for people in areas with higher or lower levels of deprivation.

Trial Design

As outlined earlier, in this trial we implemented three different conditions:

1. Control condition
2. Clarification letter condition
3. Social impact letter condition

Different households who failed to put out their recycling being randomly assigned to one of these three conditions. Both the clarification letter and the social impact letter included a link to the website where residents can order additional recycling boxes free of charge, in an effort to reduce friction costs.

Implementation

The trial started on January 16th, 2017, which is when the first letters were sent out. We started on this date as it avoided the unrepresentative period around Christmas and New Year's Eve and the bank holidays related to it (during which people were more likely to be on holiday and therefore less likely to be around to put their recycling out).

The trial was initially planned to run until May 1st, 2017. On each Monday while the trial was live, BIT received the lockout data for the week prior from Veolia. BIT then randomly assigned the households that had locked out that week into the three groups; control, clarification treatment and social impact treatment. The randomisation took into account the type of recycling, so that for missed collections of each type (food, paper, DMR) a third of the locked out households was assigned to each arm.

After conducting the randomisation, BIT sent two lists to Croydon Council's design team (one for the social impact arm, and one for the clarification arm). These lists were sent in the form of Excel sheets including the information that would be 'mailmerged' onto the letter templates. The lists contained unique identification codes provided by Veolia instead of addresses to protect individuals' privacy, and Croydon Council's design team matched these ID codes to household addresses. Then, they shared these lists with the printers contracted by the Council, and the letters were sent to households on Thursday or Friday that week. This process was to be repeated weekly, until the required sample size had been reached.

Changes in implementation plan

After the third week of the trial, BIT realised that a coding error had occurred which meant that roughly 1,100 households had been randomised into the trial multiple times. For many, this meant that they were accidentally assigned to the control condition (no letter) and to a treatment condition (letter), when any given household in the trial should only be assigned to a single condition. BIT detected this error because it worked with Croydon Council to monitor the complaints residents made to the Council, and amended the error as soon as it was detected. However, because of this error, roughly 11% of households were randomised into the trial more than once. Because eliminating this group entirely would harm the statistical power of the trial, we amended our analysis strategy to include these households. The error in randomisation meant that some households would have received a different number of letters than others. In our analysis we accounted for this by checking whether receiving different numbers of letters had any effect on results, but that does not seem to be the case.

Around this time, Croydon Council requested BIT to exclude households that were receiving assisted collections from the trial as some of these households had received letters but they are not part of the regular ECHO collections. These households were subsequently removed from the trial.

During the 7th week of the trial, BIT noticed that the weekly lockout data reflected substantially fewer lockouts than had been expected based on historic data. BIT alerted Croydon Council of this, and engaged in conversations with Croydon Council and Veolia to determine why this might be. During those conversations, Veolia explained that it had frequently had to resort to using trucks from outside their regular fleet. Unlike the standard vehicles in Croydon, the substitute vehicles did not contain an ECHO system and were therefore not recording lockout data. Substitute vehicles were used when regular vehicles broke down or were unavailable for other reasons, and Veolia were not able to report when, on which rounds, or how frequently these trucks had been used exactly.

The use of vehicles without ECHO systems meant that substantial portions of lockouts were not being reported, reducing both the number of households that were incorporated into the trial as well as BIT's ability to capture the impact of the trial with appropriate levels of statistical confidence. In light of this development, BIT and Croydon Council agreed to pause the trial to assess how to mitigate this

change. Despite BIT's efforts to find alternative solutions, none were found that could be agreed upon by Croydon Council and Veolia. Instead, Veolia provided its crews with paper sheets of addresses on which lockouts could be reported.

Analysis of lockout data including the paper-based rounds found that the number of lockouts remained well below expected levels, likely because recording on the paper-based system was not as accurate as its digital equivalent. To mitigate this, BIT and Croydon Council agreed to increase the target sample size (i.e. the number of households to be included in the trial) to offset the issues with the data. In order to reach this sample size, the trial had to be extended by several months, and Croydon Council agreed to bear the cost of sending thousands more letters during this period. Although the increase in sample size substantively resolves issues of statistical power and confidence, there remains a risk of bias^d, which reduces the probability that we can accurately detect an effect of the letters.

In week 14 of the trial (the week commencing on 24 April 2017), BIT realised that the average number of eligible weekly lockouts was still too low, and that the project would have to be extended beyond what was feasible and desirable for the project partner and funder. In light of this, BIT amended the eligibility criteria for inclusion in the trial. Specifically, where we had originally only contacted individuals who appeared in our baseline data (namely, households who had locked out in the roughly six months previous to appearing in our trial), we decided to include households who did not appear in our baseline data as well when they locked out. While this increased the chance that we would contact people who otherwise recycled consistently, it also mitigated the risk that we would miss infrequent recyclers who had recently moved into their properties or those whose lockouts were missed due to imperfect data entry.

^d Namely attenuation bias, which in this case is due to measurement error of lock outs, which makes the relationship between receiving a letter and subsequently putting recycling out more noisy.

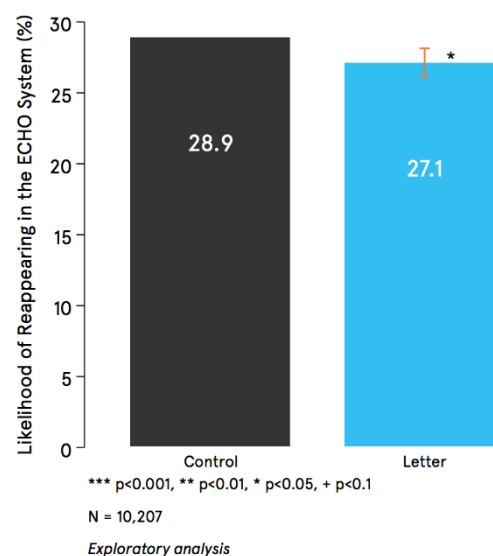
Results

Our analysis found that households that received a feedback letter were less likely to reappear in the ECHO system, meaning they were more likely to put their recycling out subsequent to receiving the letter.^e Specifically, households that received a letter as part of this trial were about 6.2% less likely to be locked out during the measurement period (a drop from 28.9% to 27.1% – see Figure 7). This can be interpreted to mean that the feedback letters significantly increased the number of people putting their recycling out.

On a technical point regarding this main analysis, it is possible that the lock out data collection processes have not necessarily captured every single household that has failed to put out recycling during the time period of this trial. This can lead to a small amount of unavoidable measurement error. However, the randomisation in this trial means that any measurement error is likely the same in the control group and the letter group, which means our finding of a difference between the groups is not substantially affected.

As previously mentioned in the implementation section of this report, the error in randomisation meant that some households received a different number of letters than others. It is feasible that the inclusion of these incorrectly randomised households in the analysis might have skewed the overall results. One way to check this is to simply exclude these incorrectly randomised households from analysis. This can provide some reassurance that our main result is robust, although it cannot give us conclusive evidence about this, as excluding the

Figure 7: Effect of receiving a feedback letter on percentage likelihood of a household reappearing in the ECHO system^a

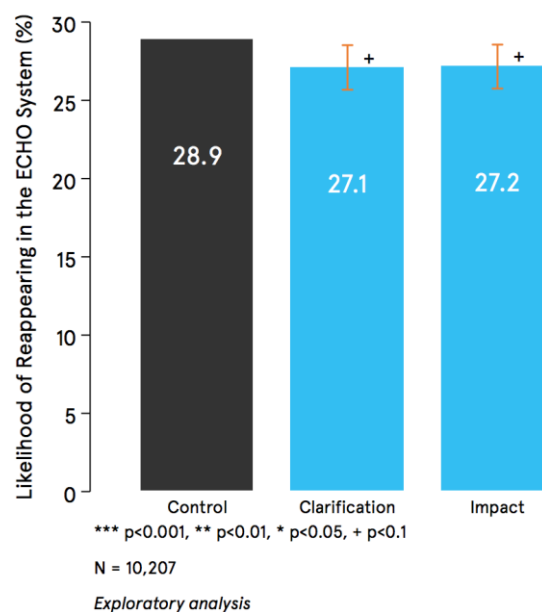


^e Following evaluation best practice, our analysis followed the pre-specified trial protocol. This protocol had not included the coding error which caused some households were included into the trial multiple times. For this reason, the results included here in the main body of the report are found under the Exploratory Analysis and Sensitivity Checks headings in the technical summary of trial results (Annex 3), rather than Primary or Secondary analysis.

incorrectly randomised households reduces the sample size of the analysis, meaning we are not able to be as statistically confident in the subsequent result. When we excluded the incorrectly randomised households, the result was directionally similar but not statistically significant (as might be expected with a smaller sample size). This result being directionally similar to our overall result increases our confidence that our overall result is correct and is not solely driven by the incorrectly randomised households.

When comparing the two letters, no significant differences were detected – the effect of the two letters seems to be the same (see Figure 8). Similarly, we did not detect significant differences based on deprivation level of the area that the household was situated in. Despite the effect of the intervention on the likelihood of a household to lock out again in the following month, we did not find significant differences between households in the different trial arms in the average total number of lockouts they had during this measurement period.

Figure 8: Effect of the treatment conditions on percentage likelihood of a household reappearing in the ECHO system



Limitations

This trial provides practical insight into how local authorities can increase the participation rates in their household recycling collection programmes. In light of the fines that local authorities may start facing if they do not meet the target of recycling 50% of waste by 2020, recycling is likely to become an increasingly pressing priority. We report a behaviourally informed approach that can help to improve recycling – providing households with letter-based personalised feedback and information can be effective in increasing participation rates in household recycling collection programmes.

However, due to certain characteristics of the current recycling systems and processes used in Croydon, the data we were able to obtain and analyse in this trial are not necessarily able to answer all the potentially related questions about how to increase recycling more broadly. For example, we were able to use lock out data to examine whether a household put their recycling out in the trial period (i.e. we looked at how to increase participation), but this does not allow us to answer the questions of how to increase the actual amount that individual households recycle, as the waste weight is not measured individually for households at any point. This household-level weight data is what would be necessary to run a trial to determine how to improve the amount that people recycle, as weighing waste collected across multiple households does not provide sufficiently high-resolution data to measure the effects of a new approach or intervention. Similarly, we could not investigate whether people recycled (more) appropriately (e.g. by reducing contamination), as this data was not collected regularly nor with similar granularity. These issues should be addressed in further research, whether by local authorities, academics or other parties.

Conclusion and lessons learned

Recycling behaviour is notoriously difficult to change, and the most impactful interventions tend to be expensive structural changes such as providing free bins and introducing kerbside collections. Researchers and governments the world over have tried to increase recycling behaviours with a range of different interventions. However, conducting a rigorous evaluation of what interventions work is difficult because it is difficult to collect precise measures of a household's recycling. The project described in this report allowed for a unique opportunity to test timely household-level feedback on recycling behaviour. Not only did this project provide unique insights into how to improve recycling behaviour, it used household-level data to evaluate the impact of the 11,283 letters sent, making it one of the largest randomised controlled trials conducted on recycling to date. This demonstrates the viability of testing new interventions at a large scale to determine what works.

This trial encountered a number of issues regarding its implementation and measurement, as is often the case with large trials conducted in the real world (as opposed to in controlled settings such as laboratory studies or online experiments). Despite these concerns, we found that sending letters to households that failed to put out their recycling reduced the likelihood that they would do so again in the month after by 6.2% (from 28.9% to 27.1%). We do not find significant differences between letters focused on motivation to recycle (social impact) and those focused on reducing the informational barriers to recycling (clarification). Both outperform the control condition, but the small difference in lockout likelihood in each treatment arm (27.1% vs. 27.2%) means we cannot say that one was better or worse than the other. In addition, our interventions seem equally effective for households of different deprivation levels.

Due to the cost of the letters and the difficulties of connecting this cost to a direct cost saving, BIT do not recommend rolling this intervention out more widely at the moment. However, if Croydon can work with Veolia to reinstate the ECHO system on all collection vehicles in the future we recommend testing whether digital communications (which are much cheaper) giving feedback on recycling behaviour would have a similar positive impact on set out rates.

Lessons learned

After this interesting and successful, but often challenging project, there are several lessons BIT, Croydon Council, and the CAB should take away.

1. Recycling behaviour is incredibly hard to change, as is confirmed by this project. By a large margin, the best predictor for whether a household was likely to put out their recycling was whether they had done so in the past. This is no surprise, but it should not be underestimated how great the challenge is in changing behaviour in recycling at scale. This trial succeeded in increasing the set-out rate under Croydon Council's household collection programme. However, the approach of sending the types of letters used in this trial takes us only a small part of the way towards meeting the Government target of recycling 50% of waste. To reach the target, it is likely essential to use multiple complementary approaches to change recycling behaviour to address structural, informational and motivational issues in the appropriate ways. The additive effect of multiple approaches is more likely than any single approach to substantially increase recycling. Going forward, BIT, Croydon Council, and the CAB should build on this piece of research by focusing on multiple aspects of recycling behaviour.
2. Projects including multiple stakeholders require clarity on who has ownership within each organisation. In the context of this project, BIT's primary contact was with Croydon Council's Transformation and Sustainability team rather than with the team directly responsible for waste and recycling. For the most part, this did not pose issues. However, it did cause some delays when trying to find solutions for implementation and measurement issues. An additional complication was that the service we worked with was delivered by an external organisation, Veolia. They were incredibly helpful where possible, but did not have a stake in the project directly and could therefore not justify making significant changes that would have benefited the trial (e.g. adding the ECHO system to all the trucks replacing broken ones).
3. In the field of recycling, it is difficult to condense every outcome into a clear cost-benefit comparison. The trial produced over 11,000 letters, at a total cost to Croydon Council of roughly £7,000. In return, households were 6% less likely to miss a recycling round the following month. While it is likely that more people setting out recycling means that more waste is recycled,

this trial cannot prove whether or not this was actually the case, as we only measured whether a bin was put out, and we did not have a direct measure of waste volume. It is therefore not clear how great the direct financial benefit to Croydon and/or Veolia may be. However, improving recycling is a priority and Croydon Council's and the CAB's commitment to, and investment in, innovation and rigorous evaluation has provided a valuable contribution to the body of research that national and local governments can draw from.

Further research in this area could try to find answers to a number of remaining questions. For example, while there is a cost associated with each letters sent, targeted digital communications can be sent at scale much more cheaply. It would be interesting to see whether digital communications would yield the same results (at a lower cost). As new technologies such as sensors and on-board weighing systems become more widespread, it will become much easier to determine the exact benefit of improved set-out rates.

Annex 1: The Behavioural Insights Team

The Behavioural Insights Team (BIT) is a unique social purpose company. BIT started life inside the UK Prime Minister's Office, No.10 Downing Street, as the world's first government institution dedicated to the application of behavioural sciences. The Team is now a world-leading consulting firm whose mission is to help organisations in the UK and overseas to apply behavioural insights in support of social purpose goals.

BIT is comprised of ex-civil servants, psychologists, behavioural economists, marketers and policy specialists. We draw on insights from behavioural science and qualitative research we conduct ourselves and with our partners to gain a deeper understanding of how people behave in reality, rather than how policy makers and economists often assume they will behave. With this informed understanding of human behaviour, we are able to provide pragmatic and tailored guidance on the design of policy, public services and communications material to encourage or discourage certain behaviours.

Wherever possible, we also turn these suggestions into real-world interventions, and empirically test the impact of those interventions, more often than not with the use of randomised controlled trials. We have successfully applied behavioural insights – demonstrated by positively evaluated outcomes – to public and private sector operations in the UK and overseas across a wide range of policy areas.

Annex 2: Intervention Letters (example)

Social Impact

CROYDON
www.croydon.gov.uk

Place Department
Public Realm Building
Stubbs Mead Depot
Factory Lane
Croydon, CR0 3RL

Date: 26 February, 2024

«add 1»
«add 2»
«add 3»
«pcode 4»
«city 5»

Dear Resident,

We came to collect your street's plastics, glass, and tin on 15/11/2016.

As we didn't find a green box at your address, we wanted to remind you how recycling plastics, glass, and tin benefits you and your community.

Did you know?
Croydon turns your plastics into bottles, and your glass gets used to build roads across the UK.
If you and all your neighbours in Croydon recycled twice as much, Croydon would save enough to build new playgrounds at 13 schools every year.
Recycling helps save space in your black bin so it doesn't overflow.
If you'd like us to send you a free food caddy, go to: www.croydon.gov.uk/myaccount

Kind regards,

Croydon Environment Team

If you do not want to receive future letters from us, or if you got this one by mistake please let us know at contact@croydon.gov.uk

Delivering for Croydon

Clarification

CROYDON
www.croydon.gov.uk

Place Department
Public Realm Building
Stubbs Mead Depot
Factory Lane
Croydon, CR0 3RL

Date: 26 February, 2024

«add 1»
«add 2»
«add 3»
«pcode 4»
«city 5»

Dear Resident,

We came to collect your street's food waste last week Monday.

As we didn't find a food waste caddy at your address, we wanted to remind you that the food waste collection is every Monday.

Did you know?
All food can go into your caddy, even teabags, chicken bones, and vegetable peelings.
If you run out of biodegradable bags, you can line your food waste caddy with old newspapers. You can also buy more bags at your local grocery store.
Recycling helps save space in your black bin so it doesn't overflow.
If you'd like us to send you a free food caddy, go to: www.croydon.gov.uk/myaccount

Your next plastics, glass, and tin collection is on 22/11/2016.

Kind regards,
Croydon Environment Team

If you do not want to receive future letters from us, or if you got this one by mistake please let us know at contact@croydon.gov.uk

160341C

Delivering for Croydon

Annex 3: Technical summary of trial results

The technical summary provides further information on the analysis underpinning our trial results including:

- A description of the data which provides summary statistics of our sample
- A summary of our exclusion criteria
- A summary of our analysis approach
- Our main analysis assessing the likelihood of a household reappearing in the ECHO system within the 4 weeks measurement period
- Our secondary analysis assessing the number of times a household reappeared in the ECHO system during the 4 weeks measurement period
- A discussion of the sensitivity of our findings

Data description

For this trial, we looked at the number of households that do not participate in Croydon Council's recycling programme. This was measured via the ECHO data system of the refuse collection services, which records each individual household that fails to present recycled material during a given collection service (i.e., food, paper, or DMR).

For each contacted household within a specific collection service there was a measurement period of 4 weeks, which started one week after the communication was received. During this time we looked at whether a household reappears in the ECHO system.

Table 4: Description of Data

Recycling Service	Treatment	N	Mean	SD
Food	Control	1,359	0.242	0.429
	Clarification	1,371	0.230	0.421
	Impact	1,376	0.237	0.425
DMR	Control	1,333	0.360	0.480
	Clarification	1,307	0.342	0.475
	Impact	1,315	0.346	0.476
Paper	Control	1,112	0.368	0.482

	Clarification	1,052	0.344	0.475
	Impact	1,058	0.318	0.466
All	Control	3,804	0.320	0.467
	Clarification	3,730	0.302	0.459
	Impact	3,749	0.298	0.457
	Total	11,283	0.307	0.461

Measurement issues and exclusions

BIT intended for each household to be treated at most one time, however due to a coding error roughly 11% of 10,070 unique households were included in the intervention twice or three times. For the primary and secondary analysis all those households, regardless of the combination of treatment assignments were dropped from the trial, leaving 8,948 unique households.

Due to lower than expected lockout number, from week 14 of the trial the eligibility criteria was relaxed such that households were no longer required to have prior history of not recycling to be included.

Analysis strategy

Primary analysis

Our primary analysis focused on whether a household reappeared in the ECHO system within 4 weeks of being contacted (yes/no). We used an OLS specification for ease of interpretation.

Specification 1: Likelihood of recurring in the ECHO system, No letter vs. Letter (OLS regression)

$$Y_i = \alpha_0 + \alpha_1 L_i + \alpha_{2m} S_i + \alpha_3 B_i + \epsilon_i$$

Y_i is a binary variable which equals to 1 if household i appeared in the ECHO system during the 4-week measurement period, zero otherwise;

L_i is a binary treatment indicator which equals to 1 if household i received an intervention letter, zero otherwise;

S_i is a vector of dummy variables indicating the type of recycling household i was locked out for

1: Food waste recycling

2: DMR recycling

3: Paper recycling

B_i is the number of previous lockouts of household in the 12 week period preceding the intervention

ϵ_i is the error term for household i

Specification 2: Likelihood of recurring in the ECHO System, Clarification vs. Social Impact (OLS regression)

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 S_i + \beta_3 B_i + \eta_i$$

Y_i is a binary variable which equals to 1 if household i appeared in the ECHO system during the 4-week measurement period, zero otherwise;

T_i is a vector of dummy variables indicating treatment assignment, where:

0: Control group

1: Clarification letter

2: Impact letter

S_i is a vector of dummy variables indicating the type of recycling household i was locked out for

1: Food waste recycling

2: DMR recycling

3: Paper recycling

B_i is the number of previous lockouts of household in the 12 week period preceding the intervention

η_i is the error term for household i

Secondary analysis

In the secondary analysis we looked at the number of lockouts during the measurement period. The specifications above was repeated with this as a continuous outcome measure using an OLS regression.

Index of Multiple Deprivation Analysis

In this section we explore whether recycling behaviour is linked to two domains of deprivation, namely:

- **The Income Deprivation Domain** measures the proportion of the population experiencing deprivation relating to low income. The definition of low income used includes both those people that are out-of-work, and those that are in work but who have low earnings (and who satisfy the respective means tests).
- **The Living Environment Deprivation Domain** measures the quality of the local environment. The indicators fall into two sub-domains. The 'indoors' living environment measures the quality of housing; while the 'outdoors' living environment contains measures of air quality and road traffic accidents.

Publicly available Index of Multiple Deprivation (IMD) data⁶⁷ was matched to trial data using postcodes, and the deciles of the income rank and living environment rank were used as additional predictors in the analysis.

Exploratory analysis

In the exploratory analysis we re-estimated the primary and secondary analysis with all households in the data set, including those who were randomised into the trial multiple times. The measurement period began one week after the first treatment assignment and ends 4 weeks after the last. Heteroscedasticity robust standard errors were clustered at household level.

Primary analysis results

Table 5, below, provides the results of the analysis of the likelihood of a household reappearing in the ECHO system within the 4 weeks measurement period. Column 1 looks at the effect of receiving a letter, while Column 2 examines the effect of each letter against the control. Both columns share the same controls namely, type of recycling the household was treated for, interaction between type of recycling and treatment and past recycling behaviour.

We observe no significant effect of the treatment on the likelihood of a household reappearing in the ECHO system during the 4-week measurement period. Households who were randomised into the trial due to not recycling DMR or paper were 7 and 5.5 percentage points more likely to reappear in the ECHO system, respectively, than those who were in the trial due to not recycling food. Past recycling behaviour is predictive of reappearing in the system, with every additional past incident of not recycling increasing the likelihood of reappearance by 4.7 percentage points.

Table 5: Effects of Treatment on Likelihood of a Household Reappearing in the ECHO system

	(1) Likelihood of a Household Reappearing in the ECHO system	(2) Likelihood of a Household Reappearing in the ECHO system
Treatment (baseline: Control)		
Clarification	-	-.013 (.011)
Impact	-	-.013 (.011)
Letter (one of the above)	-.013 (.009)	-
Type of Recycling (baseline: Food)		
DMR	.070** (.010)	.070** (.010)
Paper	.055** (.011)	.055** (.011)
Number of Incidents prior to Intervention	.047** (.002)	.047** (.002)
Constant	.123** (.010)	.0123** (.010)
Observations	N=8,948	N=8,948

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

Secondary analysis results

Table 6, below, provides the results of the analysis of the number of times a household reappears in the ECHO system during the 4 weeks measurement period. Column 1 looks at the effect of receiving a letter, while Column 2 examines the effect of each letter against the control. Both columns share the same controls, namely type of recycling the household was treated for, interaction between type of recycling and treatment and past recycling behaviour.

We observe no significant effect of the treatment on the number of reappearances in the ECHO system during the 4-week measurement period. Past recycling behaviour is predictive of reappearing in the system, with every additional past incident of not recycling increasing the number of reappearances by 0.126.

Table 6: Effects of Treatment on Number of Reappearances in the ECHO system

	(1) Number of Reappearances in the ECHO system	(2) Number of Reappearances in the ECHO system
Treatment		
Clarification	-	-.011 (.021)
Impact	-	-.001 (.021)
Letter (one of the above)	-.006 (.018)	-
Type of Recycling		
DMR	-.037+ (.021)	-.037+ (.021)
Paper	-.043+ (.022)	-.043+ (.022)
Number of Incidents prior to Intervention	.126** (.006)	.126** (.006)
Constant	.216** (.021)	.216** (.021)
Observations	N=8,948	N=8,948

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

In addition to the above, BIT used national postcode level deprivation data to assess whether there were differences in the effect depending on people's level of deprivation. The initial analysis of this suggested that there was no meaningful difference between different deprivation levels.

IMD Analysis Findings

Table 7 presents results of the IMD analysis. Columns 1 and 2 replicate the primary analysis and include the income deprivation decile and the living environment deprivation decile as covariates, respectively. Columns 3 and 4 replicate the secondary analysis.

We observe no significant effect of income deprivation on either outcome measure. Living environment deprivation is a significant predictor of both likelihood of reappearing in the ECHO system and the number of reappearances. As the quality of the local environment improves the likelihood of non-recycling decreases. One decile increase in the living environment index is associated with a 0.5 percentage points decrease in the probability of reappearing in the ECHO system and 0.009 less appearances in the system during the 4-week measurement period.

Table 7: Effects of Treatment on Recycling Patterns

	(1) Likelihood of a Household Reappearing	(2) Likelihood of a Household Reappearing	(3) Number of Reappearances in the ECHO system	(4) Number of Reappearances in the ECHO system
Treatment (<i>baseline:</i> <i>Control</i>)				
Clarification	-.013 (.011)	-.013 (.011)	-.011 (.021)	-.012 (.021)
Impact	-.013 (.011)	-.013 (.011)	-.001 (.021)	-.003 (.021)
Type of Recycling (<i>baseline:</i> <i>Food</i>)				
DMR	.070** (.010)	.062** (.011)	-.037+ (.021)	-.020 (.022)
Paper	.055** (.011)	.047** (.011)	-.043+ (.022)	-.025 (.023)
Number of Incidents prior to Intervention	.047** (.002)	.047** (.002)	.126** (.006)	.126** (.006)
Income Deprivation Decile	-.002 (.002)	-	-.002 (.003)	-
Living Environment Deprivation Decile	-	-.005* (.002)	-	.009* (.004)
Constant	.134** (.013)	.150** (.016)	.225** (.028)	.159** (.031)
Observations	N=8,945	N=8,945	N=8,945	N=8,945

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

Exploratory Analysis

Table 8, below, provides the results of the exploratory analysis which included households who were randomised into the trial more than once. Columns 1 and 2 look at the effect of the intervention on the likelihood of reappearing in the ECHO system, while Columns 3 and 4 examine the effect of the intervention on the number of reappearances in the ECHO system. All columns share the same controls namely, type of recycling the household was treated for and past recycling behaviour.

We observe a negative and significant effect of receiving a letter on the likelihood of reappearing in the ECHO system, with households in the treatment conditions being 1.9 percentage points less likely to not recycle during the measurement period. Impact letter performs significantly better than the control treatment, and the difference between the clarification letter and control treatment approaches significance.

We find no significant effects of treatment on the number of reappearances in the ECHO system.

Table 8: Effects of Treatment on Recycling Patterns

	(1) Likelihood of a Household Reappearing in the ECHO system	(2) Likelihood of a Household Reappearing in the ECHO system	(3) Number of Reappearanc es in the ECHO system	(4) Number of Reappearanc es in the ECHO system
Treatment (<i>baseline: Control</i>)				
Clarification	-	-.018+ (.010)	-	-.022 (.024)
Impact	-	-.019* (.010)	-	-.018 (.023)
Letter (one of the above)	-.019* (.009)	-	-.020 (.020)	-
Type of Recycling (<i>baseline: Food</i>)				
DMR	.090** (.009)	.090** (.009)	.072** (.022)	.072** (.022)
Paper	.086** (.009)	.086** (.009)	.108** (.022)	.108** (.022)
Number of Incidents prior to Intervention				
	0.49** (.001)	0.49** (.001)	.213** (.004)	.213*** (.004)
Constant	.116** (.009)	.116** (.009)	.024 (.024)	.024 (.024)
Observations	N=11,283	N=11,283	N=11,283	N=11,283

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

Exploratory Analysis Including IMD

Table 9 presents the results of the exploratory analysis with the living environment deprivation decile as an additional predictor.

We find that one decile increase in the living environment deprivation index is associated with a 0.5 percentage points decrease in the probability of reappearing in the ECHO system during the 4-week measurement period. Living environment is not a significant predictor of the number of reappearances.

Table 9: Effects of Treatment on Likelihood of a Household Reappearing in the ECHO system

	(1) Likelihood of a Household Reappearing in the ECHO system	(2) Number of Reappearances in the ECHO system
<i>Treatment (baseline: Control)</i>		
Clarification	-.018+ (.010)	-.022 (.024)
Impact	-.020* (.010)	-.018 (.023)
Letter (one of the above)	-	-
<i>Type of Recycling (baseline: Food)</i>		
DMR	.082** (.009)	.065** (.025)
Paper	.078** (.009)	.102** (.026)
Number of Incidents prior to Intervention	.049** (.001)	.213** (.004)
Living Environment Deprivation Decile	-.005* (.002)	-.005 (.004)
Constant	.147** (.014)	.051** (.034)
Observations	N=11,280	N=11,280

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

Sensitivity Checks

To establish whether the results of the exploratory analysis are purely driven by the households which were assigned to a letter condition more than once, we removed those households from the sample and re-estimate the primary specification.^f

We find that households which received a letter remain significantly less likely to appear in the ECHO system than households in the control (see Table 10). The effects of individual letters are no longer significant at conventional levels.

Table 10: Effects of Treatment on Likelihood of a Household Reappearing in the ECHO system

	(1) Likelihood of a Household Reappearing in the ECHO system	(2) Likelihood of a Household Reappearing in the ECHO system
Treatment (<i>baseline: Control</i>)		
Clarification	-	-.018+ (.010)
Impact	-	-.017+ (.010)
Letter (one of the above)	-.018* (.010)	-
Type of Recycling (<i>baseline: Food</i>)		
DMR	.080** (.009)	.080** (.009)
Paper	.080** (.010)	.080** (.010)
Number of Incidents prior to Intervention	.052** (.002)	.052** (.002)
Constant	.118** (.010)	.118** (.010)
Observations	N=10,207	N=10,207

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

^f 500 unique households were dropped.

Discussion

Although the primary and secondary analysis of this trial did not produce significant results, they must be interpreted in light of a number of implementation issues.

Due to a coding error roughly 11% of households were randomised into the trial more than once. To follow the pre-specified trial protocol we excluded those household from the main analysis and found no significant differences between treatment groups and the control group in recycling behaviour. Exploratory analysis inclusive of all households, including those which appeared in the trial two or three times, found that receiving a letter significantly reduced the likelihood of a household appearing in the ECHO system by almost 6%. This result cannot be explained by a dosage effect, as even when households who were assigned to a letter conditions more than once are excluded from the analysis, it remains significant. As such it is likely that a larger sample size allows for a detection of a smaller effect.

It is important to note that the data provided by the trial partner has substantial discrepancies due to Veolia having to use trucks without the ECHO system on occasions when vehicles from its usual fleet broke down. As such the results are likely attenuated by measurement error.

Endnotes

- ¹ Letsrecycle.com (26 May 2016). *WRAP: Fewer councils receiving income from recycling*. Retrieved from: <http://www.letsrecycle.com/news/latest-news/wrap-fewer-councils-receiving-income-from-recycling/>
- ² DEFRA (2016). UK Statistics on Waste. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/547427/UK_Statistics_on_Waste_statistical_notice_25_08_16_update_2_.pdf
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- ⁴ Veolia (2016). Croydon. Retrieved from: <http://www.veolia.co.uk/london/services/services/croydon>
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- ⁷ WRAP (2010). Analysis of kerbside dry recycling performance in the UK 2008/09 – Summary report. Retrieved from: <http://www.wrap.org.uk/sites/files/wrap/EVA143-000%20Kerbside%20Dry%20Benchmarking%20UK%2008-09%20Report%20FINAL%20for%20publication%20V2%201.pdf>
- ⁸ Behavioural Insights Team (2014). *EAST: Four Simple Ways to Apply Behavioural Insights*. London. Retrieved from: www.behaviouralinsights.co.uk/publications/east-four-simple-ways-to-apply-behavioural-insights/
- ⁹ WRAP (2016). 3Rs recycling knowledge, attitudes and reported behaviour survey 2015 – Highlights report. Retrieved from: http://www.wrap.org.uk/sites/files/wrap/3Rs%20Recycling%20Highlights%202015%20FINAL%20FOR%20PUBLICATION_1.pdf
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Applying behavioural insights to improve recovery of Housing Benefit Overpayments in Croydon

A report by the Behavioural Insights Team

October 2017

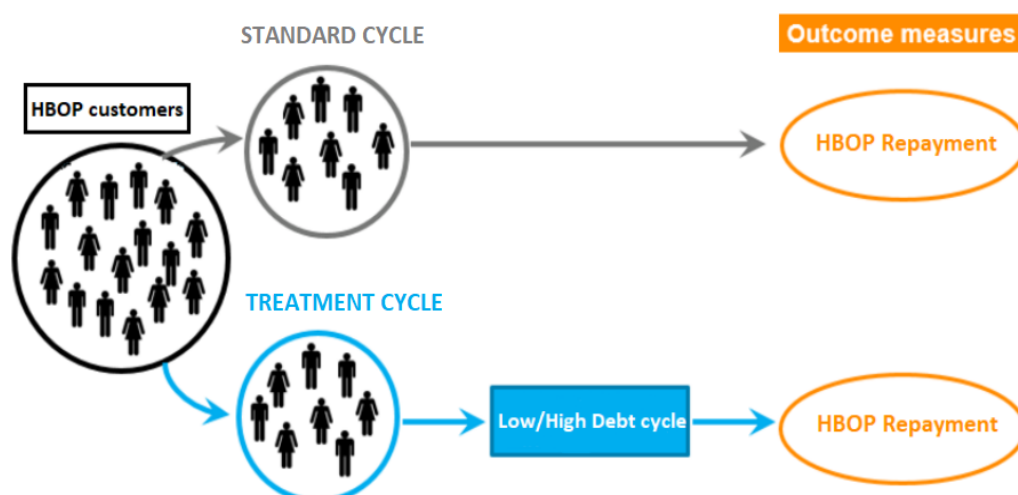
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Executive summary

Overpayment of Housing Benefit is a considerable cost for local authorities and there is currently over £2 billion of outstanding debt which is increasing each year.¹ London Councils commissioned The Behavioural Insights Team (BIT) to work with Croydon Council on a project to increase the repayment rates of Housing Benefit Overpayments. Between December 2016 and August 2017, we sent behavioural letters to customers to whom Housing Benefit has been overpaid who had an income. The primary aim was to increase the proportion of debtors who agree to repay their Housing Benefit Overpayment (HBOP) and the amount of repaid. We ran a randomised controlled trial to test the effectiveness of the behavioural letters. Debtors were randomly assigned to receive one of two letter cycles:

- ❖ **Standard cycle (Control)** - The letter cycle currently sent out by Croydon Council, consisting of: the first notification letter, the first reminder (15 days later) and the final reminder (a further 15 days later).
- ❖ **Behavioural cycle (Treatment)** - a new letter cycle which we simplified, personalised and made more action focused. We used social norm and active choice (made salient by a flow diagram) messaging to increase the HBOP repayment. The group of debtors was divided into different cycles based on whether the debt was above or below £300:
 - **'Low' debt cycle** - debtors with overpayment below £300 received following information: *"Most people (70%) with a debt like yours choose to pay it off in one go."*
 - **'High' debt cycle** - debtors with overpayment above £300 received following information: *"Most people (80%) with a debt like yours choose to pay by monthly instalments as part of a Payment Plan."*



Results

We analysed the impact of the behaviourally-informed letters on our two key outcomes:



- ❖ **The behavioural letters increased the proportion of debtors who repay their HBOP within 45 days by 14%** compared to the standard (control) letters. This result was driven by a strong, statistically significant effect with customers who were 'previously advised'² where the repayment increased by 42% compared to the control group.



- ❖ **The behavioural letters also increased the amount repaid per invoice sent by 25%.** At the average amount repaid this equates to a £90 difference (£360 in control and £450 in treatment). It should be noted that the increase in the repayment rate across all customers and in the amount repaid per invoice is significant at the 10% level rather than the conventional 5% level.



- ❖ We estimate that the behavioural letters brought forward **additional £56,000** during the trial period (8 months). This could bring forward an **estimated £212,000 per year** along with £4,500 less spent on debt recovery.

The social norm in the behavioural letters also influenced how customers repaid, nudging them towards the default repayment method most common for their debt size: those with a low debt were 28% more likely to repay in one go (but not less likely to repay via payment plan), while those with a high debt were 18% more likely to pay via a payment plan (but not less likely to repay via a lump sum). These changes were statistically significant at the 5% level.

In sum, we found a positive and promising impact of the behavioural letters. Given the consistent positive direction of the effects on both the size and method of repayment across different customer groups and debt levels, we are confident that these results are robust despite the fact that the results were only significant at the 10% level rather than at the conventional 5% level.

Therefore, we recommend:

- ❖ Croydon Council Croydon extends the behavioural letters to other HBOP customer groups (such as 'recoverable from landlords').
- ❖ All Councils in London explore the application of the successful insights from this trial to their HBOP and other payment collection letters, with BIT's assistance if needed.

In this trial we implemented a number of insights we have tested in previous work. For example, we simplified the letters and made the next step in debt recovery process salient. We also tested more novel approaches and these are detailed in the table below.

New insights gained from the HBOP trial



→ Target customer groups by debt size

One-size-fits-all letters with many repayment options can feel unadapted and can lead to customers disengaging.

Solution: People with low debts can be persuaded to repay in one go. Those with high debts should be automatically offered a Payment Plan.



→ Anchor customers with high total debt on a lower figure

Customers may be discouraged from repayment when they face the exuberant total amount.

Solution: Referring to a smaller sum -such as the amount of monthly instalment - can make repayment seem more feasible.



→ Anchor customers with a specific higher monthly instalment

Customers who set up a payment plan may choose as low instalment, as possible.

Solution: Mentioning how much people typically choose to repay by month (social norm) can encourage people to choose similar instalment amount.

Background

Every year, hundreds of millions of pounds of Housing benefit is overpaid, adding to the total £2 billion of outstanding housing benefit debt.³ In the context of funding cuts, local authorities could benefit from improving their capacity to recover these liabilities. Yet, Housing Benefit overpayment represents a particularly complex challenge from the behavioural perspective. Compared to payment of taxes or fines, overpaid customers are likely to find it psychologically more painful to repay money which they considered theirs. Moreover, tax-related literature shows that people can excuse themselves from not paying as a mere omission, rather than a deliberate infraction which would burden their conscience.

Croydon Council, supported by London Councils, asked the Behavioural Insights Team (BIT) to design, test and evaluate a behavioural intervention to improve the recovery of Housing Benefit overpayments.

Housing Benefits Overpayments and the recovery process in Croydon

Housing benefit (HB) is a means tested social security benefit distributed to help meet housing costs for rented accommodation. It is administered by local authorities. Various changes in recipients' circumstances can affect their HB entitlement. For example a change of address, income, rent, other benefits or the number of people within the household can all have an impact on HB entitlement. If the recipient of HB does not update their details following a change in circumstances, the Council will pay the wrong amount of HB. This lack of updating leads to a build up of HB overpayment or underpayment which can amount to thousands of pounds.

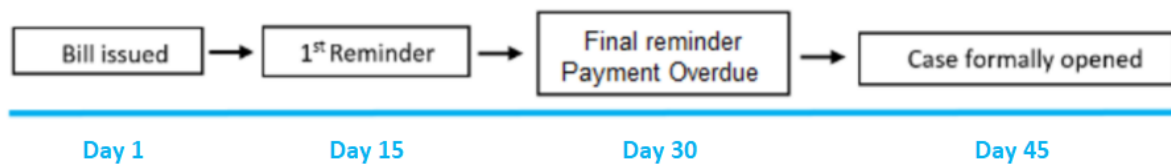
While the tenant is obliged to immediately notify the authorities of any change in circumstances, they often do not do so. To some extent, this is because many have working hours or even jobs that change on a weekly basis which makes accurate updating relatively burdensome.⁴ Moreover, people in a state of 'scarcity' (for more detail see Scarcity mindset in Literature review) tend to have less mental bandwidth handle these additional tasks required or complex financial issues,⁵ especially when these are cognitively taxing by design.⁶

Croydon Council's total current overpayment debt amounts to millions of pounds. Over the six months to October 2016, Croydon Council issued invoices for HB overpayments totaling over £8m. Only around £1.5m of this was paid back or covered by a payment plan. At an individual level the average HB overpayment in Croydon is £2,000 with a repayment rate within the deadline of only 23.5%.⁷ Given

the size of the overpayments even a relatively small increase in the number repaying their HB overpayment would bring forward considerable funds for Croydon.

The Process

The overpayment recovery process starts with the Council sending out a notification letter requesting repayment. If no payment is made after 15 days, the recipient receives a reminder letter, followed by a final reminder, 30 days after the initial notification. The final reminder informs the recipient about the payment being overdue, leaving another 15 days to repay. Once this period elapses, an HB recovery officer formally opens the case and starts pursuing the debtor. Croydon Council estimates that the administrative cost of pursuing each invoice is £34.



The Aim of the trial

Croydon Council and London Councils asked the Behavioural Insights Team (BIT) to help to increase the repayment of HB Overpayments in Croydon by drawing on findings from behavioural science. BIT worked with Croydon to test new approaches to try to:

- increase the proportion of HB Overpayments repaid; and
- increase the value of HB repayments.

Background to the Behavioural Insights Team

The Behavioural Insights Team (BIT) is a unique social purpose company. BIT started life inside the UK Prime Minister's Office, No.10 Downing Street, as the world's first government institution dedicated to the application of behavioural sciences. The Team is now a world-leading consulting firm whose mission is to help organisations in the UK and overseas to apply behavioural insights in support of social purpose goals.

BIT is composed of ex-civil servants, psychologists, behavioural economists, marketers and policy specialists. We draw on insights from behavioural science and ethnographic research we conduct ourselves and with our partners to gain a deeper understanding of how people behave in reality, rather than how policy

makers and classical economists often assume they will behave. With this informed understanding of human behaviour, we are able to provide pragmatic and tailored guidance on the design of policy, public services and communications material to encourage or discourage certain behaviours.

Wherever possible, we also turn these suggestions into real-world interventions, and empirically test the impact of those interventions, more often than not with the use of randomised controlled trials. We have successfully applied behavioural insights – demonstrated by positively evaluated outcomes – to public and private sector operations in the UK and overseas across a wide range of policy areas.

Structure of the Report

The rest of this report is structured as follows:

- Literature review: a short review of the behavioural science literature relating to repayment
- The trial: description of the interventions and trial design
- Results: an overview of results from the trial
- Conclusion

Literature Review

This section describes the behavioural science behind the intervention designed to improve HB Overpayment Recovery. We cover **the five key** insights, based on the EAST framework. This framework states that if you want to change behaviour, make it **E**asy, **S**ocial, **A**tttractive and **T**imely (EAST).

EASY

Scarcity Mindset & Simplicity

The human capacity to retain and process⁸ information has been shown to be limited, especially in the context of mental fatigue.⁹ Recent behavioural research shows that cognitive ability can be especially reduced for people in situations which induce a 'scarcity mindset'.¹⁰ Essentially, our mental 'bandwidth' (cognitive and decision-making capacities) is a finite resource that is more quickly depleted if we are preoccupied by a scarcity of any kind. For example, an individual who is ill (is suffering from a 'health scarcity') has his mind taken up by thoughts about his current illness, which leaves him less 'mental space' to focus on other issues. Evidence shows that poverty imposes an especially heavy 'cognitive tax' on people's decision-making.¹¹ For instance, one study revealed that simply stimulating concerns about financial issues for poorer people can erode cognitive performance as much as one sleepless night.¹² This new research on scarcity can help to explain the 'irrational' behaviour sometimes displayed by people in disadvantaged circumstances.

Application to HBOP: Some of the recipients of HB are likely to be the victims of a 'scarcity mindset'. Given this it is important for government to minimise time and mental costs of using services and make it as easy as possible for people on low incomes to make good decisions for themselves. This implies that letters about benefits overpayments should be as simple as possible and the choice and consequences of non-repayment should be clearly phrased and graphically represented by diagrams.

ATTRACTIVE

Gain and Loss Frames

Behavioural science has shown that people are generally loss averse.¹³ Studies suggest that people tend to experience a loss twice as powerfully as an equivalent gain¹⁴ and will work twice as hard to avoid it. It could be argued that loss aversion for the things we own might be even more powerful (the so-called 'endowment

effect'¹⁵). Therefore, it might be particularly painful to lose something which we value as ours.

Application to HBOP: Loss aversion reinforced by the endowment effect could lead to low repayment via two channels. Firstly, HB recipients might be reluctant to report a change in circumstances which would reduce future payments. Secondly, they may find it hard to repay money previously paid to them which they therefore consider as theirs.

However, loss framing can be also turned to the Council's advantage. Deterrence and threat messages emphasising the costs associated with an action have traditionally been effective at changing behaviour in the payment collection context.¹⁶ Risk aversion makes the potential negative repercussions salient – such as detection and ensuing legal and financial sanctions – and motivates improvements in payment behaviour.¹⁷

Omission Bias, Self-Serving Bias and Active Choice

People consider the outcomes of a decision differently depending on whether they are the result of an action or a lack of an action. This 'omission bias' is an exaggerated preference for inaction.¹⁸ For instance, people will judge withholding the antidote from a poisoned person less harshly than poisoning someone, even though the consequences are exactly the same.¹⁹ The key behavioural explanation is that a lack of a clear deliberate action hampers the attribution of responsibility and blame²⁰ both at the individual and societal level. On one hand, people may prefer omission because if caught, they presume they will be judged less harshly.²¹ On the other hand, omission is easier to justify to themselves.²² Lack of evidence for a dishonest intention complicates not only the attribution of blame²³ by a third-party, but it also facilitates the individual's self-justification.

A related point is that people have greater tendency to act dishonestly when they can in some way justify their actions. In such a case, their conscience can be soothed by self-serving bias²⁴ (a tendency to interpret situations in a way that protects our ego), coupled with the attribution effect²⁵ (a propensity to blame external conditions for our own behaviour). This cognitive process is quite common in the 'debt mindset' where people typically blame unjust banks or broader economic circumstances for their debt.²⁶ Experimental evidence shows that this perception can be countered by using more explicit self-compromising language. In an experiment which included claiming money, participants cheated less when language targeted their identity ("Please don't be a cheater) rather than focusing on action ("Please don't cheat").²⁷

Application to HBOP: Some people may be framing the issue as an omission: a failure to inform of a change in circumstances, a failure to respond to a notification or a failure to repay. As a result of this ‘omission framing’, people might feel excused and underestimate the gravity of their actions. In addition, the self-serving and attribution bias could switch blame on the confusing and misleading system.

Behavioural research suggests that reframing the action as an active choice with repercussions, triggering the loss aversion can be effective at overcoming omission bias.²⁸ In a BIT trial in cooperation with the World Bank in Guatemala, a letter which emphasised that a failure to declare income will no longer be considered as an oversight, but as an active choice with associated consequences, more than tripled tax receipts relative to the standard letter.²⁹ This approach has also proven effective in a series of HMRC trials on tax credits, almost doubling the repayment of the debt obligation within 30 days from 12% in the control group to 23% in the treatment group payment rate. This can be re-enforced by drawing the attention of debtors to being monitored by institutions with a reliable third-party information about their situation. Depending on the different collection contexts, this approach led to a 5-20 percentage point increase in the payment rate.³⁰ In another recent trial in Costa Rica, firms which had failed to file their tax return on time received emails which highlighted third-party information on their income. As a result, the income tax declaration rate tripled and the payment rate doubled.³¹

SOCIAL

Social Norms

We are heavily influenced by the behaviour of those around us and the implicit or explicit expectations within a particular society or group.³² Social norms, especially ‘descriptive norms’ - which relate to the way that most people behave - have proved highly effective at altering behaviour. Presenting feedback that shows people as outliers from the group can lead them to adjust to the prevalent norm. BIT has successfully tested this across different countries (Guatemala, Costa Rica and Poland) and in different contexts (tax collection, tax credit repayment and fine payments).

In a BIT trial with HMRC we found that letting people know that most people pay their tax on time significantly increased payment.³³ This approach has also been used at the local authority level and in Medway it helped to increase payment rates by 11 percentage points.³⁴ BIT’s most successful social norm formulation to date has been the ‘minority norm’,³⁵ singling out debtor’s behaviour: ‘You are currently in the very small minority of people who have not paid on time’.

Application to HBOP: Unfortunately, the prevalent norm in benefits overpayment may not be timely repayment. Yet the Council could use the social norm messaging, for example, to counter a frequent misperception that a large proportion of benefits is claimed fraudulently³⁶ or to promote the method of repayment that most debtors find convenient.

TIMELY

Implementation intentions and action planning

There is often a gap between what people intend to do and what they actually do. Behavioural research suggests that creating a concrete plan of action that specifies when, where and which actions need to be taken can help bridge this gap between intentions and outcomes.³⁷ In practice, this means people should be encouraged to come up with a specific plan of action, which ideally is written down. For example, this kind of advanced plan-making significantly improves the uptake of influenza vaccinations³⁸ and the attendance of colonoscopy appointments.³⁹

In the context of income tax payments were increased both when people were prompted to set a plan to contact the tax authority tomorrow or when urged to make contact immediately. In both cases, the intervention worked thanks to a clear – if arbitrary – deadline. Behavioural research suggests that a deadline can help overcome procrastination and prioritise the task completion,⁴⁰ because of the sense of urgency and ‘time scarcity’ it creates.⁴¹

Application to HBOP: Prompting people to respond immediately or by a near deadline and providing clear plan of action could increase the repayment rate.

The Trial

The aim of our trial was to test the impact of behavioural letter cycle on the debtors' agreement to repay their HB Overpayment (either in a lump sum or by signing up for a payment plan).

The Letters

Before the trial people with HB overpayments receive up to three letters requesting payment. These are set out below.

Letter Cycle	Details
First Notification Letter	The first letter informs the HB recipient about an overpayment, recently detected by the Council. The recipient then has 30 days to appeal or repay.
First Reminder Letter	A reminder is automatically sent out 15 days after the first notification and 15 days before the expiration of the 30 day notification period unless the debt is paid off in this time.
Last Reminder Letter	The final letter sent out 30 days after the first notification and informs the recipient that they now have a payment overdue. The recipient is granted 10 more days to repay or set up a Payment Plan. After 10 days elapse, a debt recovery officer formally opens up the case and starts effectively pursuing the recipient for repayment.

The Intervention

We only targeted the HB recipients with income, leaving out the HB recipients on other benefits who already repay automatically by benefit deductions.^a To maximise the impact, we re-designed all three letters normally sent out with an escalating tone: from a friendly first letter suggesting a default repayment method, a stronger worded reminder highlighting the cost of failure to repay, to the final letter using active choice to stress the responsibility for not responding.

Our behavioural letters drew on the five insights summarised in the literature review. All the letters were **simplified** to only include essential information phrased in easy and clear language. The letters were made more **action-focused**, stating clearly the amount owed and the **deadline** for repayment.

We decided to present a 'smart default' for the payment method, tailoring the content of the letter based on the size of the debt. This repayment option was easy (for instance, by providing a tiny url instead of the main 'pay for it' website requiring multiple click-throughs), attractive (e.g. by contrasting the high overpayment and the high potential penalty with the relatively smaller typical monthly instalment) and social (based on social norm, i.e. suggesting the payment option preferred by the majority of repaying debtors). Based on our preliminary data analysis, customers with low debts were encouraged to pay in one go and customers with high debts were advised to sign up for a payment plan.^b Therefore, we split the treated HB recipients in two following groups:

- **'Low' debt cycle:** overpayment below £300, the majority repays in full.
- **'High' debt cycle:** overpayment above £300, the majority repays via payment plan.

A figure of £300 was used because when looking at historical repayment data people roughly 80% of people above this threshold paid off via a payment plan and below this threshold roughly 70% paid off in a lump sum. A round figure was also used to make the randomization process for the benefit officers simpler.

To address the cognitive scarcity, we used flow-diagrams to clearly represent the current status of debtor within the process, the available choices and their

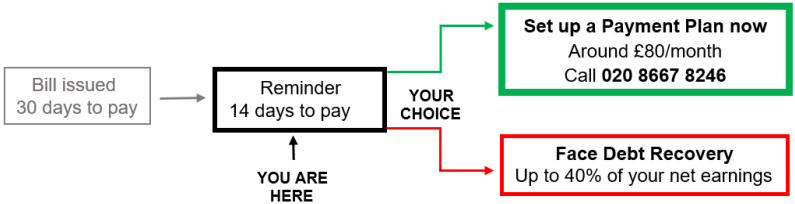
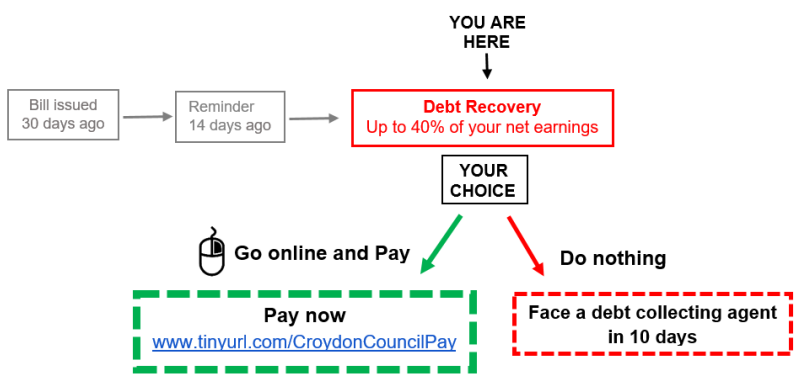
^a Including those who were first advised on their overpayment while they were on other benefits.

^b We found that around 70% of people with a debt below £300 repay in a lump sum, while approximately 80% of people with a debt above £300 repay via payment plan.

consequences. Implementation intentions were used to help with action planning: e.g." If you cannot call us now, please plan a time to call us."

The new behavioural versions of these letters are described in the table below (full copies in Annex 1). In order to test the efficacy of these letters they were tested against the standard letter cycle.

Letter Type	Details of intervention
Standard letter cycle (control)	These were the 'business as usual' letters routinely sent out by Croydon Council: the first notification, the reminder letter, the final letter
Treatment letter cycle	
First notification (p. 31-32 for 'low debt' cycle, p. 35-36 for 'high debt' cycle)	The main intervention consisted of an introduction of a personalised social norm message about the method of repayment preferred by the majority of people within the same debt bracket. For the 'High' Debt cycle this was: <i>'Most people (80%) with a debt like yours choose to pay by monthly instalments as part of a Payment Plan.'</i> For the 'Low' Debt cycle (p.31,32) this was: <i>'Most people (70%) with a debt like yours choose to pay it off in one go.'</i>
Reminder (p. 33 for 'low debt' cycle, p. 37 for 'high debt' cycle)	The reminder letters repeat the social norm default method of payment (e.g. Payment Plan or full payment online). The cost of failure to repay is clearly stated and made more salient by adding a simple diagram visualising the debtor's options. 'High' Debt cycle example

	
Last reminder letter (p. 34 for 'low debt' cycle, p. 38 for 'high debt' cycle)	The final letters included an active choice message: <i>'Previously, we treated your lack of response as an oversight. Now, if you do not contact us, we will consider this to be your active choice.'</i> A diagram ('Small' Debt example) is again used to visualise the active choice. 

Implementation

The trial ran from December 2016 to 18th August 2017. This was longer than initially planned, due to the lower number of invoices sent per week than initially estimated. During this time, Croydon Council received notifications that 2,096 customers eligible for inclusion in the trial had been overpaid HB. These notifications come to Croydon from number of sources. For example, HMRC may advise that a customer has had a change in income which the council are not aware of. Each of these debtors is assigned to a benefits officer, responsible for creating an invoice and for sending the notification letters requesting repayment of their HB Overpayment.

To robustly evaluate our intervention, we needed to randomise the debtor population - i.e. randomly allocate the debtors in the standard or the new letter group. Croydon's benefit officers undertook randomisation on a daily basis, assigning each invoice to either control or treatment letter cycle based on HB reference number being even or odd, respectively. In practice, benefit officers use a computer interface to select the cycle of letters to be sent from a dropdown list when they are creating the invoice. Instead of the usual one option for HB overpayments, this dropdown option was replaced with three options: one for odd HB reference numbers, one for even HB reference numbers and debts below £300 and one for even HB reference numbers and debts above £300 (for details see intervention below). Once a benefits officer set the cycle of letters to be sent, all the letters were sent out periodically and automatically unless a payment is received. This removed the risk of contamination resulting from a mistake resulting in an individual receiving both treatment and control letters during the duration of the trial.

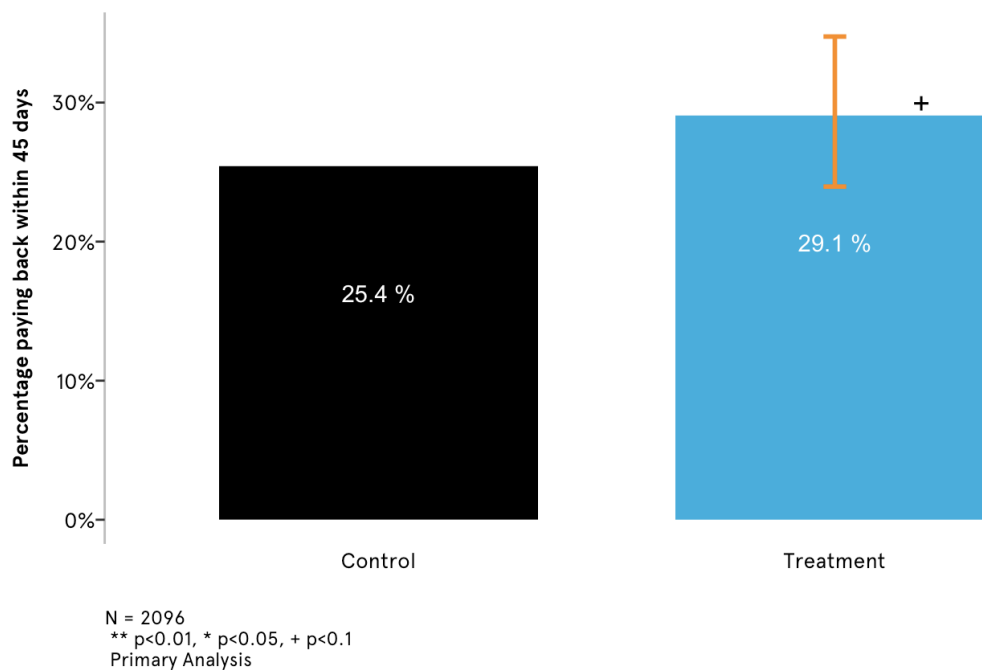
Results

Effect on likelihood of repayment within 45 days

The key outcome measure was whether customers repaid overpayment - in full or by setting up a payment plan - within 45 days of receiving the first letter with invoice (i.e. in the time frame before entering the debt recovery process). We found that the behavioural letters increased the rate of repayment of HB overpayment, compared to the standard (control) letters.

The rate of repayment in the control group was 25.4% but rose to 29% for those in the treatment group. This represents an increase of 14% in the proportion of people repaying within 45 days. However, while the behavioural letters generated higher repayment than the standard letters, the effect was only statistically significant at the 10% level rather than the conventional 5% level ($p = .08$).

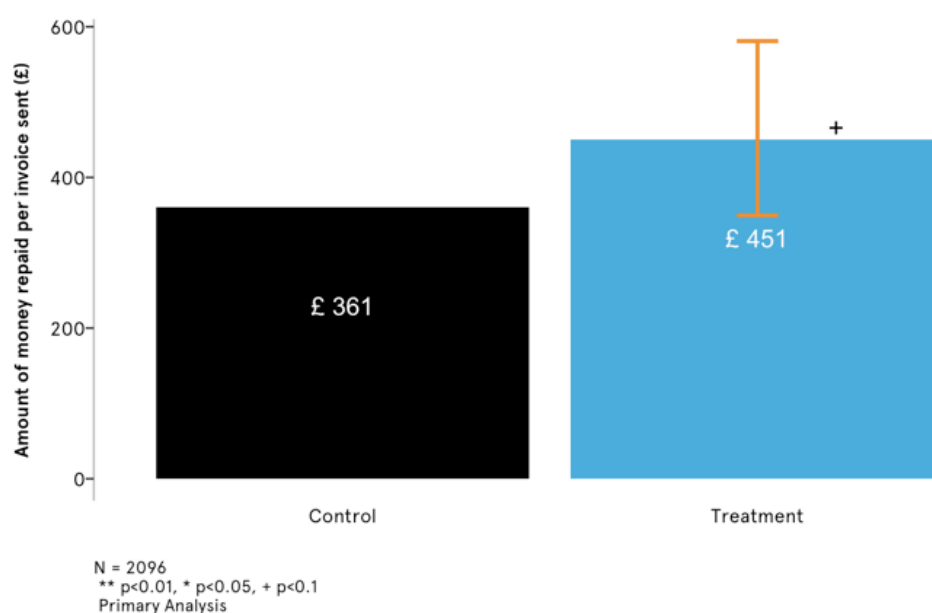
Figure 1. Repayment within 45 days by treatment condition



Effect on amount repaid per invoice sent

The revised letters also increased the amount repaid, as customers who received behavioural letters tended to repay a larger amount than those who received the standard letters. Customers in the treatment group on average repaid 25% more per invoice sent (at the average amount repaid, this equates to a £90 difference). Again this finding is significant at the 10% level rather than the conventional 5% level.

Figure 2. Amount repaid per invoice sent within 45 days

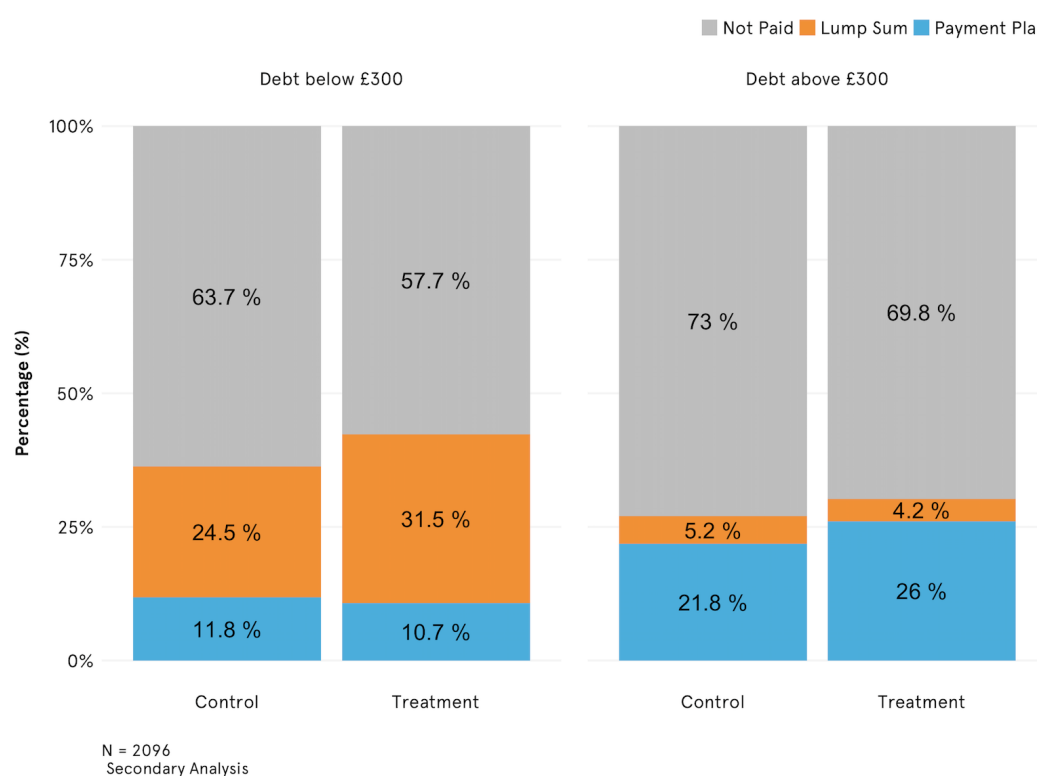


Overall, we estimate that the behavioural letters brought in £56,000 of additional revenue during the trial period. If these letters are rolled out, Croydon Council should be able to collect estimated extra £212,000 per year and save £4,500 in costs associated with debt recovery. The cost of the intervention itself is only the cost of colour printing for two of the behavioural letters. This would be roughly £520 per year (see Annex 2 for calculations).

Effect on repayment method

We were also interested to see whether the type of letter influenced *how* people tended to repay. To maximise the repayment, we used different messages on the size of their debt. That is why, we aimed to steer customers with low debts to pay in one go and to encourage customers with high debts to sign up for a payment plan. To achieve this aim, we tailored the behavioural letters to convey a social norm about the common payment method based on the size of a customer's debt. Customers with an overpayment below £300 (the low debt cycle) were told that the majority of people with a debt like theirs repays in cash, while those with a debt above £300 (the high debt cycle) were advised to pay in monthly instalments within a Payment Plan.

Figure 3. Method of repayment by treatment condition



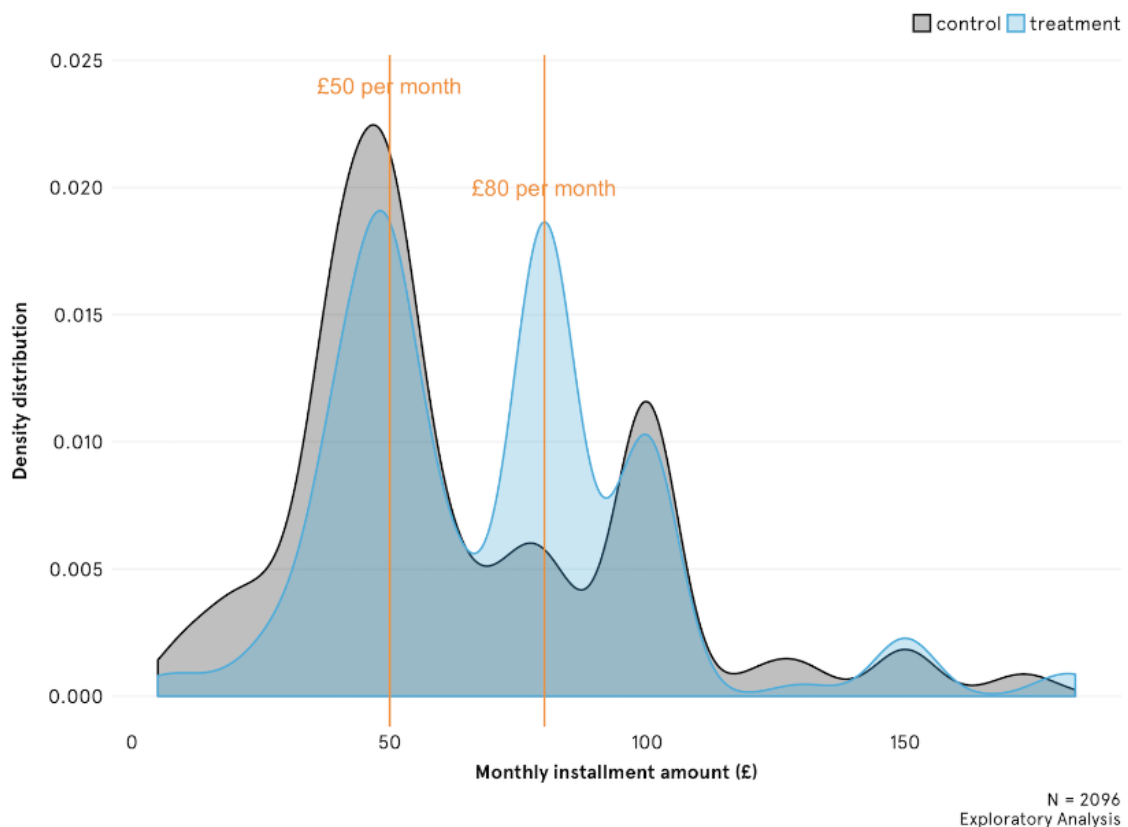
We found that the behavioural letters had the desired effect. Those in the 'low debt' cycle were significantly more likely to repay via a lump sum but not significantly less likely to repay in a payment plan. Conversely, those in the 'high debt' cycle were significantly more likely to repay via a payment plan and not significantly less likely to repay via a lump sum. Both of these results were significant at the 5% level.

Effect on monthly instalment amount

To increase the likelihood that customers with high debts made a repayment, we referred to a lower figure owed – the *monthly instalment* – rather than the total debt. At the same time, the figure chosen for the ‘*typical*’ monthly instalment was relatively high, to maximise the amount collected. We found some evidence that customers who received behavioural letters with the £80 suggestion on average tended to repay with a higher instalment (£72 per month vs £58 per month), compared to the control group. This estimated anchoring effect, however, was not statistically significant at conventional levels.

Interestingly, when the raw monthly repayment amounts are plotted, we can observe a bunching around £80 per month in the treatment group, not present in the control group.

Figure 4. Density plot of monthly instalments by treatment condition^c



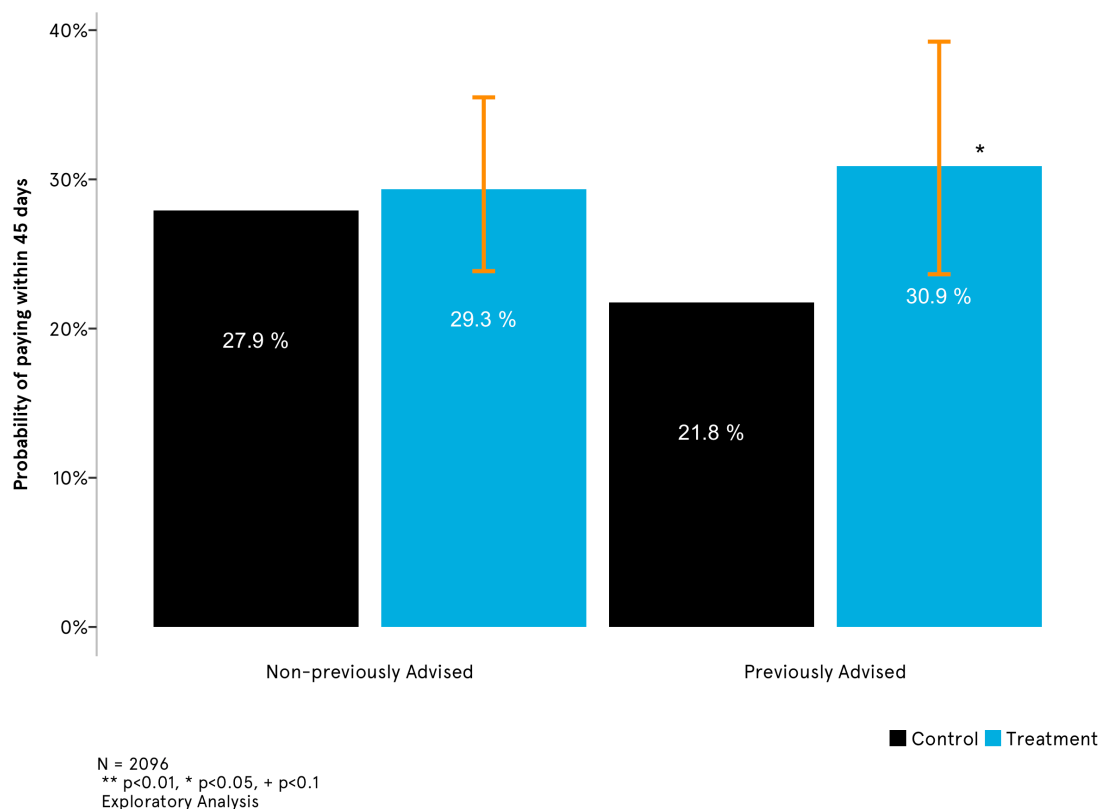
^c Due to the skewed distribution instalments above £200 per month (5% of total) are not included.

Effect on different customer groups

We further analysed the data by looking at different customer groups included in our sample. Our sample included two customer types: 'non-previously advised' customers who were being contacted about a HB overpayment by Croydon Council for the first time; and 'previously advised' customers who were previously notified about a HB overpayment but owing to a recent change in circumstances (e.g. a change in income) must now pay back the overpayment directly rather than via deductions to an existing entitlement. Surprisingly, we found that the effect of behavioural letters were stronger and highly statistically significant for the 'previously advised' customers, a group with lower repayment rate prior to the trial. While in the control group 21.8% previously advised customers repaid their overpayment, 30.9% of those who received behavioural letters did so. This represents an increase of 9.1 percentage points, equivalent to a 42% increase in the proportion of previously advised customers repaying within 45 days.

In the non-previously advised group, the effect of revised letters was directionally positive but not statistically significant and weaker, equivalent to a 1.4 percentage points increase in the repayment rate.

Figure 5. Repayment within 45 days by customer group



We can only hypothesise about the reasons behind the strong effect of behavioural letters on previously advised customers. One plausible explanation could be that the original letter benefitted more from behavioural improvements than for the non-previously advised group. Another possibility is that the previously advised group face a higher cognitive load. We explore these in turn below.

The original letter for the 'previously advised' group did not specify how customers repay very clearly. This means that a customer willing to repay has to be motivated enough to research what the different options for repayment are (e.g. cash, payment plan, phone).

Another potential reason could be that the previously advised group are less likely to make the additional effort to find out how to repay. When they receive their HBOP letter, previously advised customers are transitioning from benefits into work which is bound to be a very busy period when many different things require their attention. This 'scarcity' of cognitive resources could explain why they may be more likely to overlook HB overpayment and not repay, especially because of the extra hassle to find out how to do it.

Given this context, it seems only intuitive that a behavioural letter should be more effective because it made repayment easier for this highly cognitively strained group: it clearly explained the transition from weekly deductions to payment and offered a default payment method based on what other people with similar debt are doing.

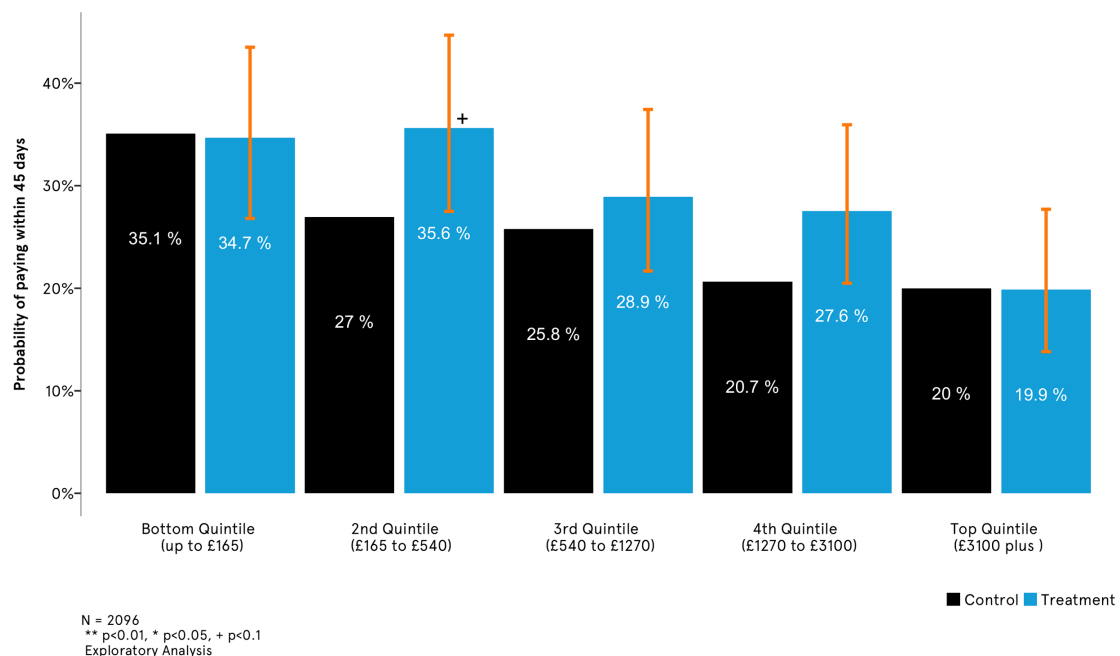
Effect of different letters

We also looked at whether some of the letters in the treatment cycle were more impactful than others. Overall, it seems that the effect on repayment can be attributed to the complete series of letters rather than one in particular. That said, we found some tentative evidence suggesting that the likelihood of repayment might have risen just after the reception of the first 'friendly' behavioural letter. Should this directional finding be confirmed, it would be an interesting insight about the relative impact of deterrence-focus vs. providing targeted advice for the payment collection. However, further testing with a larger sample size would be required to be able to settle this question definitively.

Effect at different debt levels

We explored whether the effect of the treatment letters varied depending on debt level. The behavioural letters seem to have influenced customers with medium sized debts but had little impact on repayment of customers with very low or very high debts (below £165 or above £3100).

Figure 6. Repayment rates across quintiles of debt amount



Conclusion

In this trial we found that behavioural letters increased the proportion of debtors who agree to repay their Housing Benefit Overpayment (HBOP), as well as the amount they repaid. The repayment rate in the treatment group increased by 14%. This overall result was driven by a marked change in the behaviour of the 'previously advised' customers where the repayment increased by almost a half (to 31% in the treatment group, compared to 22% in the control). The social norm in behavioural letters also influenced how customers repaid, nudging them towards the default repayment method most common for their debt size: those with a low debt tended to repay in one go, while those with a high debt opted for monthly instalments.

The behavioural letters brought forward an additional £56,000 during the trial period. We recognize that our overall results were statistically significant at the 10% level, rather than the conventional 5% significance level. However, this trial outcome seems robust given the consistent positive direction of the effects on both the size and method of repayment across different customer groups and debt levels, with no negative effects at any level. Therefore, we recommend Croydon Council roll out the behavioural letters as the new business as usual. We estimate this will bring forward estimated £212,000 per year not including saved enforcement costs. We also think there is scope to use this approach in other areas. Firstly, Croydon could extend the behavioural letters to other HBOP customer groups (such as 'recoverable from landlords'). Secondly, the messaging used in these letters could be used in many of the wider revenue collection letters used across London.

New insights gained from the HBOP trial

This trial applied some behavioural insights that we have previously tested. It also yielded some fresh insights:

→ Target customer groups by debt size



One-size-fits-all letters with many repayment options can feel unadapted and make customers disengage.

Solution: People with low debts can be persuaded to repay in one go. Those with high debts should be automatically offered just the Payment Plan.

→ **Anchor customers with high total debt on a lower figure**

Customers may be discouraged from repayment when they face the exuberant total amount.



Solution: Referring to a smaller sum - such as the amount of monthly instalment - can make repayment seem more feasible.

→ **Anchor customers with a specific higher monthly instalment**

Customers who set up a payment plan may choose as low instalment, as possible.



Solution: Mentioning how much people typically choose to repay by month (social norm) can encourage people to choose similar instalment amount.

Annex 1: Behaviourally-informed letters

Low Debt: Notification of Invoice

«Name»
«Address1»
«Address2»
«Address3», «Address4»
«Postcode»

Customer reference: «claim_refno»
«trdate»

You have received too much Housing Benefit

Dear «FIRST NAME»

Your circumstances changed on «Effectivedate». We learned about this on «Advisedate» from xxx, which stated that yyy. This change has reduced your benefit entitlement. Unfortunately, because we have only just learned about this change, your Housing Benefit has been overpaid.

You need to pay £xx back within 30 days.

Most people (70%) with a debt like yours choose to pay it off in one go. Please plan a time today to go online and pay at www.croydon.gov.uk and selecting the link to 'pay for it'. Or you can use this link we simplified for your convenience: www.tinyurl.com/CroydonCouncilPay. If you don't think you can pay in full, call 020 8667 8246 to set up a Payment Plan.

For more information about the overpayment and other payment options, please see overleaf.

Yours sincerely



Karen Sullivan
Head of Customer Contact
Benefits Department
Croydon

Low Debt: Notification of Invoice for Previously Advised

«Name»
«Address1»
«Address2»
«Address3», «Address4»
«Postcode»

Customer reference: «claim_refno»
«trdate»

You have received too much Housing Benefit

Dear «FIRST NAME»

My letter dated «Notif_Date» advised you that you have been overpaid Housing Benefit. Previously we have been taking this out of your Housing Benefit. Since you are no longer receiving Housing Benefit you must pay us back directly. Of your debt of £«amount», £«amount» remains outstanding.

You need to pay £«opamount» back within 30 days.

Most people (70%) with a debt like yours choose to pay it off in one go. Please plan a time today to go online and pay at www.croydon.gov.uk and selecting the link to 'pay for it'. Or you can use this link we simplified for your convenience: www.tinyurl.com/CroydonCouncilPay. If you don't think you can pay in full, call 020 8667 8246 to set up a Payment Plan.

For more information about other payment options please see the attached form.

Yours sincerely



Karen Sullivan
Head of Customer Contact

Low Debt: First Reminder

Resources
Corporate debt recovery service
Croydon

«Name»
«Address1»
«Address2»
«Address3»

Contact: Barbara O'Neill
cdrec1@croydon.gov.uk
«Officer»/trt001b

«Postcode»

Your ref: «claim_refno»
«trdate»

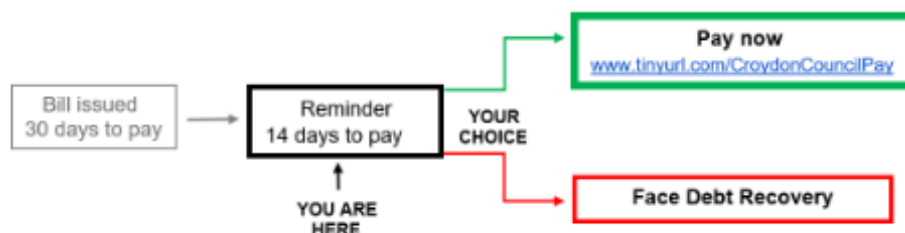
Reminder: Housing Benefit overpayment

Amount due: £«os_amount»

Dear «first name»

On «invdate», we informed you that due to a recent change in your circumstances, we have overpaid your benefit. We learned about this from xxx which stated that yyy. You will have to pay : £ «os_amount» back. We asked you to contact us, but we haven't heard from you yet.

You still have a chance to avoid debt recovery.



Please be fair to those still receiving housing benefit and repay at: at www.croydon.gov.uk and selecting the link to 'pay for it' (simplified link for you: www.tinyurl.com/CroydonCouncilPay). If you don't think you can pay in full, call 020 8667 8246 to set up a Payment Plan.

If you don't contact us within 14 days, we will instruct a debt recovery officer to reclaim this debt. This could involve a debt collecting agent or direct deduction from your pay.

For more information about the overpayment and other payment options, please see overleaf.

Yours sincerely,

Barbara O'Neill
Corporate debt recovery manager

Low Debt: Overdue Notice

Resources
Corporate debt recovery service

«Name»
«Address1»
«Address2»
«Address3»
«Address4»
«Postcode»

Contact: Barbara O'Neill
cdrec1@croydon.gov.uk
«Officer»/trt001b

Your ref: «claim_refno»
«trdate»

PAYMENT OVERDUE: Housing Benefit overpayment

Amount overdue: £«os_amount»

Dear «surname»

The bill for your debt sent to you on «invdate» is now overdue.

Previously, we treated your lack of response as an oversight. Now, if you do not contact us, we will consider this to be your active choice.

This is your last chance to pay back. Pay online at www.croydon.gov.uk, selecting the link to 'pay for it' (or go directly: www.tinyurl.com/CroydonCouncilPay) or call 020 8667 8246 to set up a flexible Payment Plan.

Otherwise, we will start taking recovery action against you, which could include deductions taken directly from your pay or action by a debt collecting agent.



Please act now.

Yours sincerely,

Barbara O'Neill
Corporate debt recovery manager

High Debt: Notification of Invoice

«Name»
«Address1»
«Address2»
«Address3», «Address4»
«Postcode»

Customer reference: «claim_refno»
«trdate»

You have received too much Housing Benefit

Dear «FIRST NAME»

Your circumstances changed on «Effective date». We learned about this on «Advise date» from xxx, which stated that (reason). This change has reduced your benefit entitlement. Unfortunately, because we have only just learned about this change, your Housing Benefit has been overpaid.

You need to pay £xx (*OP amount*) back within 30 days or set up a Payment Plan (typically £80).

Most people (80%) with a debt like yours choose to pay by monthly instalments as part of a Payment Plan. Payments typically are only about £80 per month if you set up a plan now.

Call 020 8667 8246 to pay or set up a Payment Plan today.

For more information about the overpayment and other payment options, please see overleaf.

Yours sincerely



Karen Sullivan
Head of Customer Contact
Benefits Department
Croydon

Address that this Housing Benefit overpayment relates to:

Overpayment address: «claddress1» «claddress2» «claddress3» «claddress4» «clPostcode»

High Debt: Notification of Invoice for Previously Advised

«Name»
«Address1»
«Address2»
«Address3», «Address4»
«Postcode»

Customer reference: «claim_refno»
«trdate»

You have received too much Housing Benefit

Dear «FIRST NAME»

My letter dated «Notif_Date» advised you that you have been overpaid Housing Benefit. Previously we have been taking this out of your Housing Benefit. Since you are no longer receiving Housing Benefit you must pay us back directly. Of your debt of £«amount», £«amount» remains outstanding.

You need to pay £xx back within 30 days or set up a Payment Plan (typically £80).

Most people (80%) with a debt like yours choose to pay by monthly instalments as part of a Payment Plan. Payments typically are only about £80 per month if you set up a plan now.

Call 020 8667 8246 to pay or set up a Payment Plan today.

For more information about other payment options please see the attached form.

Yours sincerely



Karen Sullivan
Head of Customer Contact

«Name»
«Address1»
«Address2»
«Address3», «Address4»
«Postcode»

Customer reference: «claim_refno»
«trdate»

You have received too much Housing Benefit

Dear «FIRST NAME»

My letter dated «Notif_Date» advised you that you have been overpaid Housing Benefit. Previously we have been taking this out of your Housing Benefit. Since you are no longer receiving Housing Benefit you must pay us back directly. Of your debt of £«amount», £«amount» remains outstanding.

You need to pay £xx back within 30 days or set up a Payment Plan (typically £80).

Most people (80%) with a debt like yours choose to pay by monthly instalments as part of a Payment Plan. Payments typically are only about £80 per month if you set up a plan now.

Call 020 8667 8246 to pay or set up a Payment Plan today.

For more information about other payment options please see the attached form.

Yours sincerely



Karen Sullivan
Head of Customer Contact

High Debt: First Reminder

High Debt: Overdue Notice

Resources
Corporate debt recovery service

«Name»
«Address1»
«Address2»
«Address3»
«Address4»
«Postcode»

Contact: Barbara O'Neill
cdrec1@croydon.gov.uk
«Officer»/trt001b

Your ref: «claim_refno»
«trdate»

PAYMENT OVERDUE: Housing Benefit overpayment

Amount overdue: £«os_amount»

Dear «surname»

The bill for your debt sent to you on «invdate» is now overdue.

Previously, we treated your lack of response as an oversight. Now, if you do not contact us, we will consider this to be your active choice.

Unless you call us now on 020 8667 8246 to pay this amount or set up a flexible Payment Plan, we will start taking recovery action against you, which could include deductions taken directly from your pay or action by a debt collecting agent.



Please act now.

Yours sincerely,

Barbara O'Neill
Corporate debt recovery manager

Annex 2: Technical annex

This annex contains a more detailed presentation and discussion of the results of the trial.

Introduction

The aim of this trial was to test whether behavioural science-informed changes to the letters sent to people who have received an overpayment of Housing Benefit (HB) and who now have to repay it to Croydon Council. These overpayments occur for a number of reasons, for example if a person's entitlement changes as a result of change in work or in their residence. If the person does not inform the council of this change they will be overpaid HB.

Summary of findings

The key finding is that we find some evidence that the behavioural science-informed letters increase the likelihood that a recipient repays within 45 days of receiving their first notification letter by 3.6 percentage points ($p = .08$).^d The repayment rate in the control group is 25.4% (95% CI; [21%, 30%]) while in the treatment group it is 29% (95% CI; [24%, 35%]).^e

We also find an increase in the amount of money that people who received the behavioural letters pay or agree to repay via a payment plan ($p = .09$). The increase is estimated to be 25% higher, or a £90 difference at the average amount repaid.

The exploratory analysis suggests that most of the effect is driven by customers in the "previously advised" category. These are customers who had been having their overpayment recovered through direct deductions to their benefits.

^d Note that this is above the 5% level typically used.

^e These figures are estimated marginal effects at the means of the covariates rather than the raw means.

Outcome Measures

There are four primary and secondary outcome measures:

Whether or not an individual agrees to pay back the debt either in a lump sum or via a payment plan: The main outcome measure in this trial will be whether or not an individual signs up to repay the housing benefit (either via a payment plan or through a lump sum). From the time that a notification letter is sent informing the person that they need to repay, they have 45 days until their case is officially opened by an officer who will begin the process of recouping the debt. A person is classified as having not repaid if they enter this process.

Average amount repaid per invoice sent: This outcome measure will capture the total amount that is agreed to be repaid within 45 days per invoice sent. The definition of repayment in time is the same as above.

The proportion of people who repay after first notification: This outcome will measure whether those in the treatment group are more likely to repay after the first notification letter than those in the control group.

Monthly instalment value: The monthly instalment value is the monthly amount that people agree to pay back if they agree to pay back via a payment plan. The analysis assesses whether or not those that received the behavioural letters paid back in a higher monthly instalment.

Description of Data

The data was transferred from Croydon Council to BIT. The final dataset used in the analysis comes in a number of different datasets.

- The Debt R006 has data on all payments against invoices
- The Debt R004 has all the invoices for that have been generated
- The Debt R009 contains the reason for the overpayment
- The Debt R003 contains the details about how people are paying back their instalments

These datasets can be merged using the unique invoice ID as a merging indicator. A file of historical debts is also used in order to see how many historical debts a customer has.

Table 1: Total numbers and % paid in control and treatment groups

	Total number	Number paid in 45 days	% paid within 45 days
Control	1108	328	29.6%
Treatment	989	335	33.9%

The total sample included in the trial and the treatment/control indicators for these individuals were identified based on the letters that they were sent. The “treatment cycle” defines the type of letters that were sent to each customer.

There were new treatment cycles created for the new letters. Based on the final digit of the housing benefit reference number and the size of the debt the benefit officer would allocate the customer to receive the appropriate “treatment cycle”. The debt size was used to indicate whether a customer received the letter nudging them to repay in a lump sum (debts below £300) or received the treatment letter nudging them to repay via a payment plan.

Analytical Strategy

Outcome 1: The first primary outcome to be analysed is whether or not the behavioural letters increase the proportion of people who agree to repay the housing benefit. This will be measured using a model with the following specification

Specification 1: Likelihood of agreeing to repay overpaid housing benefit (logistic regression)

$$\begin{aligned} \text{logit}(\Pr(Y_i = 1)) \\ = \alpha + \beta_0.T_i + \beta_1\log(A_i) + \beta_2H_i + \beta_3Q_i + \beta_4D_i + \beta_5M_i \end{aligned}$$

Where $\Pr(Y_i = 1)$ is a linear function to predict the probability that individual i agrees to repay the housing benefit (either via a payment plan or in a lump sum), within 40 days of receiving the invoice.

$T_{i,j}$ is a vector of binary treatment indicators, where individual i receives treatment j , where j equals 1 if individual i receives the treatment letters and equals 0 if individual i receives the control letters.

$\log(A_i)$ is the natural log of the total invoice amount in pounds sterling for individual i .^f

H_{ik} is a fixed effect for the benefit officer who handles the case for individual i .

Q_{ip} is a vector of reasons for the HB overpayment to individual i indicates the reason for the overpayment (e.g. increase in income).

D_i is the number of existing HB overpayment invoices that individual i has in the Croydon Council database.

M_{iq} is a fixed effect the month in which the invoice is sent to individual i .

α is the regression constant

Outcome 2: The second primary outcome is whether the amount repaid per invoice sent is higher for individuals who receive the treatment letters.

^f The log is taken due to the right skewed distribution of the debt balances.

Specification 2: Log of the total invoice amount that is agreed to be repaid (OLS regression).

$$\log(Bal_i) = \alpha + \beta_0 T_i + \beta_1 H_{ik} + \beta_2 Q_i + \beta_3 D_i + \beta_4 M_i + \varepsilon_i$$

$\log(Bal_i)$ is the log of the amount that is agreed to be repaid by individual i within 40 days plus £1. If a payment is not made against the invoice within 40 days this will take the value of £1 (this is to prevent taking the log of 0). The log of the balance is used due to the right-skewed nature of the distribution of debt balances.

ε_i is an error term with White robust standard errors.

All other covariates are the same as in specification 1 apart from the removal of the log of the invoice balance as a covariate.

Outcome 3: The first secondary outcome is whether those in the treatment group that agree to repay are more likely to do so via the method we are suggesting in the letters we send them. For low debts, this will be via a lump sum; while for high debts this will be via a payment plan. This outcome will be measured using the following specification.

Specification 3: Likelihood of agreeing to repay via a payment plan, in a lump sum or not repaying (multinomial logistic regression)

$$\text{logit}(\Pr(Y_i = k)) = \alpha + \beta_0 L_{ij} + \beta_1 \log(A_i) + \beta_2 H_i + \beta_3 Q_i + \beta_4 D_i + \beta_5 M_i$$

$\Pr(k, i)$ is a function to predict the probability that individual i has outcome k , where k is a vector of three outcomes: non-payment, payment via a payment plan and payment through a lump sum.

$L_{i,j}$ is a vector of treatment indicators, where individual i receives treatment, which equals 1 if individual i receives the low-debt treatment letters, equals 2 if individual i receives the high-debt treatment letters and equals 0 if individual i receives the control letters.

All other covariates are the same as in specification 1 above.

Outcome 4: The second secondary outcome measure is whether those in the treatment group are more likely to repay after the first notification letter than those in the control group. This will be measured with the following specification.

Specification 4 Likelihood of repaying after the first notification letter (logistic regression).

$$\begin{aligned} \text{Logit} (Pr(Y_i = 1 | R_i = 0)) \\ = \alpha + \beta_0 T_i + \beta_1 \log(A_i) + \beta_2 H_i + \beta_3 Q_i + \beta_4 D_i + \beta_5 M_i \end{aligned}$$

Where $Pr(Y_i = 1 | R_i = 0)$ is a linear function to predict the probability that individual i agrees to repay the housing benefit (either via a payment plan or in a lump sum) conditional on not receiving the first reminder letter ($R_i = 0$). For the analysis we will likely define those who did not receive the first reminder letter as those who repaid within 15 days of the invoice being sent.

All covariates are the same as in specification 1 above.

Outcome 5: Monthly instalment value is the third secondary outcome measure.^g The hypothesis is that there will be a difference between the monthly instalments of those that choose to pay by a payment plan in the control and treatment groups.

The reasoning behind this hypothesis is that £80 will act as an anchoring amount and that monthly instalments will be closer to £80 in the treatment group than the control group.

Specification 5: Monthly instalment amount

The following analytical strategy will be used to test this hypothesis

$$\log(MI_i | PP_i = 1) = \alpha + \beta_0 T_i + \beta_1 \log(A_i) + \beta_2 H_i + \beta_3 Q_i + \beta_4 D_i + \beta_5 M_i$$

Where $\log(MI_i | PP_i = 1)$ is the log of the monthly instalment amount that individual i agrees to pay back, conditional on individual i setting up a payment plan ($PP_i = 1$)

All covariates are the same as in specification 1 above.

^g This outcome measure was added in an addendum to the TP in March 2017.

Primary Analysis Findings

Primary outcome 1: Likelihood of paying (or agree to pay via payment plan within 45 days. Table 2, below, provides the main results of the analysis. Columns 1 through to 4 provide the results of the logistic regression models with slightly differing specifications.

- Column 1 shows the exact model specified in the TP.
- Column 2 adds the (censored) debt maturity which is the number of days from invoice being received to the 16th of August or 45 days, whichever is lower.
- Column 3 drops the fixed effect for “reason for overpayment” and instead includes a fixed effect for whether a customer is previously advised or not, this should be included given the imbalance in treatment and control for this group.
- Column 4 runs the same specification as column 3 but with “reason for overpayment” added back in.
- Column 5 runs the same specification as column 4 but on the dataset after it has been pre-processed using a CEM matching algorithm and observations are weighted according to the CEM weights.^h

We can see that in all 5 specifications there is a consistent treatment effect which is not markedly changed by the addition/dropping of covariates or running the analysis on matched data.

We conclude that specification number 4 is the most thorough and should be the one that is reported.

^h This is performed as a robustness check owing to an imbalance in the matching

Table 2: Paid within 45 days (logistic regression)

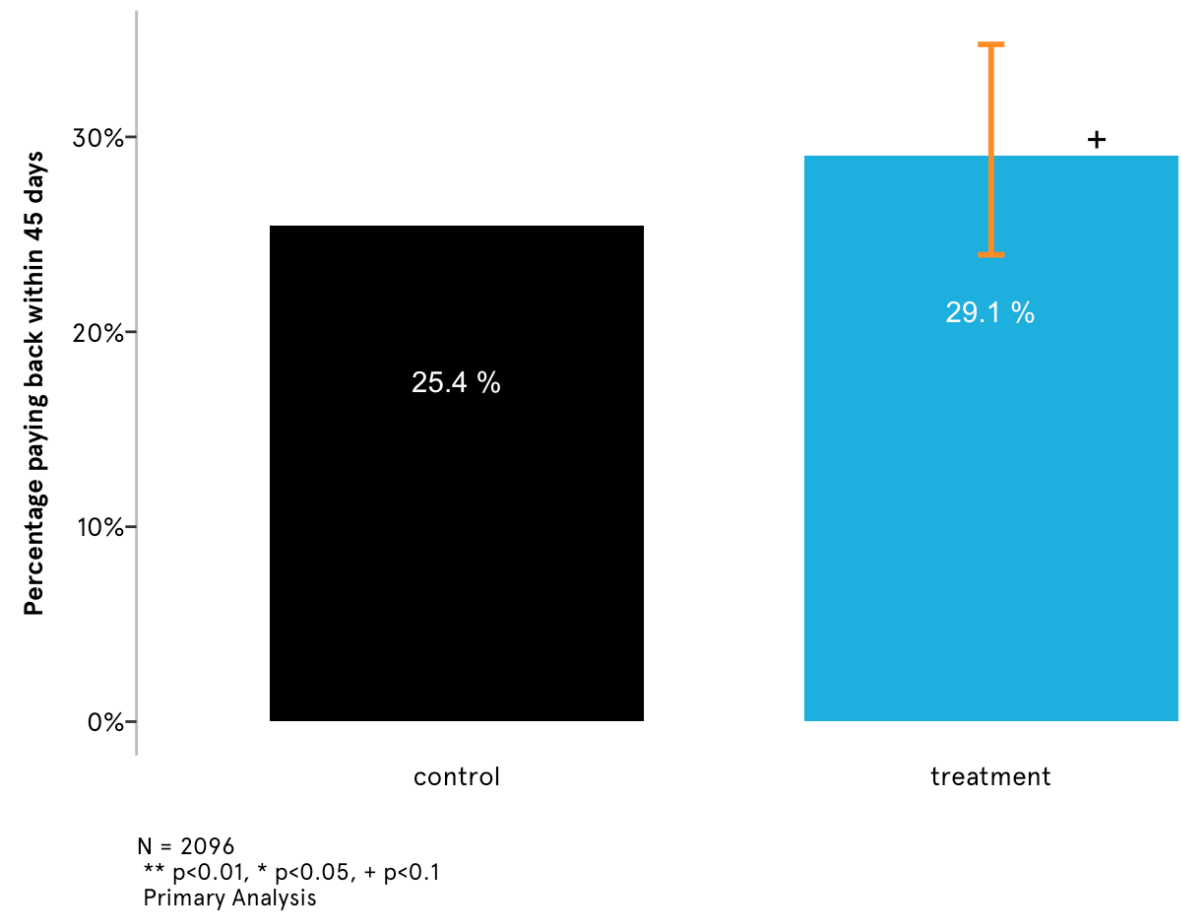
	Dependent variable:				
	Paid within 45 days				
	TP exact (1)	Debt maturity (2)	Prev advised drop reason (3)	Prev advised and reason (4)	Matched Data (5)
treattreatment	0.185* (0.103)	0.190* (0.103)	0.175* (0.103)	0.183* (0.104)	0.170 (0.103)
ReasonForOverpaymoved out of the above address	-0.202 (0.171)	-0.175 (0.172)		-0.184 (0.173)	-0.172 (0.170)
ReasonForOverpayother	0.416 (0.282)	0.479* (0.287)		0.487* (0.288)	0.500* (0.286)
ReasonForOverpayPreviously advised	-0.197 (0.157)	-0.193 (0.157)		-0.111 (0.176)	-0.169 (0.185)
PrevAdvisedTrue			-0.182 (0.129)	-0.151 (0.146)	-0.155 (0.152)
days_from_inv_censored		0.096** (0.024)	0.096** (0.024)	0.097** (0.024)	0.097** (0.024)
LogDebt	-0.190** (0.033)	-0.186** (0.033)	-0.177** (0.033)	-0.182** (0.033)	-0.174** (0.033)
Month2	0.008 (0.200)	0.009 (0.200)	-0.011 (0.199)	0.012 (0.200)	-0.045 (0.195)
Month3	0.123 (0.185)	0.115 (0.186)	0.122 (0.187)	0.147 (0.188)	0.109 (0.186)
Month4	0.387* (0.205)	0.387* (0.205)	0.422* (0.211)	0.445* (0.213)	0.458* (0.211)
Month5	-0.396* (0.188)	-0.396* (0.188)	-0.356* (0.194)	-0.344* (0.195)	-0.307 (0.192)
Month6	-0.465* (0.182)	-0.467* (0.182)	-0.422* (0.188)	-0.415* (0.188)	-0.433* (0.187)
Month7	-1.199** (0.226)	0.249 (0.395)	0.290 (0.398)	0.306 (0.399)	0.263 (0.397)
Month8	-3.657** (0.528)	0.034 (1.039)	0.140 (1.033)	0.125 (1.042)	0.005 (1.058)
Month12	-0.383 (0.548)	-0.390 (0.548)	-0.285 (0.545)	-0.397 (0.548)	-0.393 (0.518)
customer.number.debts	-0.322** (0.084)	-0.319** (0.084)	-0.314** (0.084)	-0.320** (0.084)	-0.357** (0.105)
Benefit_Officer_Num_2	-0.813* (0.383)	-0.796* (0.384)	-0.817* (0.382)	-0.804* (0.384)	-0.846* (0.383)
Benefit_Officer_Num_3	-0.927* (0.393)	-0.924* (0.394)	-0.925* (0.393)	-0.912* (0.395)	-1.090** (0.399)
Benefit_Officer_Num_4	-0.203 (0.375)	-0.163 (0.377)	-0.198 (0.376)	-0.181 (0.377)	-0.194 (0.377)
Benefit_Officer_Num_5	-0.584 (0.422)	-0.508 (0.425)	-0.543 (0.423)	-0.514 (0.425)	-0.523 (0.422)
Benefit_Officer_Num_6	-0.563 (0.392)	-0.567 (0.393)	-0.586 (0.392)	-0.572 (0.393)	-0.574 (0.391)
Benefit_Officer_Num_7	-0.556 (0.381)	-0.514 (0.383)	-0.529 (0.381)	-0.513 (0.383)	-0.586 (0.383)
Benefit_Officer_Num_8	-0.612 (0.408)	-0.582 (0.409)	-0.606 (0.409)	-0.619 (0.411)	-0.713* (0.412)
Benefit_Officer_Num_9	-0.327 (0.433)	-0.322 (0.434)	-0.301 (0.432)	-0.341 (0.434)	-0.465 (0.437)
Benefit_Officer_Num_10	-1.147** (0.391)	-1.148** (0.391)	-1.164** (0.390)	-1.159** (0.392)	-1.186** (0.391)
Benefit_Officer_Num_11	-0.461 (0.451)	-0.399 (0.455)	-0.472 (0.453)	-0.415 (0.455)	-0.450 (0.457)
Benefit_Officer_Num_12	-0.084 (0.424)	-0.180 (0.423)	-0.232 (0.422)	-0.187 (0.424)	-0.189 (0.421)
Benefit_Officer_Num_13	-0.032 (0.447)	-0.058 (0.449)	-0.078 (0.447)	-0.055 (0.449)	0.014 (0.448)
Benefit_Officer_Num_14	-1.103* (0.534)	-1.078* (0.538)	-1.026* (0.534)	-1.042* (0.538)	-1.117* (0.550)
Benefit_Officer_Num_15	0.247 (0.513)	0.262 (0.515)	0.260 (0.514)	0.275 (0.516)	0.388 (0.533)
Benefit_Officer_Num_16	-0.131 (0.382)	-0.119 (0.383)	-0.045 (0.381)	-0.075 (0.385)	-0.191 (0.392)
Benefit_Officer_Num_17	-0.398 (0.444)	-0.384 (0.445)	-0.461 (0.442)	-0.391 (0.445)	-0.424 (0.443)
Benefit_Officer_Num_18	0.043 (0.389)	0.075 (0.391)	0.040 (0.390)	0.070 (0.391)	0.139 (0.390)
Benefit_Officer_Num_19	0.359 (0.449)	0.385 (0.454)	0.357 (0.452)	0.384 (0.454)	0.676 (0.458)
Benefit_Officer_Num_20	-0.302 (0.389)	-0.327 (0.389)	-0.381 (0.388)	-0.335 (0.389)	-0.311 (0.389)
Benefit_Officer_Num_21	-0.387 (0.314)	-0.388 (0.314)	-0.405 (0.313)	-0.391 (0.315)	-0.406 (0.316)
Benefit_Officer_Num_22	-0.749* (0.432)	-0.706 (0.433)	-0.770* (0.427)	-0.713* (0.434)	-0.736* (0.438)
Benefit_Officer_Num_23	-0.212 (0.414)	-0.208 (0.414)	-0.204 (0.413)	-0.190 (0.414)	-0.295 (0.414)
Benefit_Officer_Num_24	-0.675 (0.441)	-0.696 (0.441)	-0.594 (0.441)	-0.625 (0.446)	-0.566 (0.451)
Benefit_Officer_Num_25	-0.362 (0.500)	-0.365 (0.502)	-0.381 (0.498)	-0.377 (0.503)	-0.522 (0.528)
Benefit_Officer_Num_26	-0.650 (0.407)	-0.653 (0.407)	-0.697* (0.405)	-0.667 (0.407)	-0.799* (0.407)
Benefit_Officer_Num_27	-0.411 (0.445)	-0.422 (0.445)	-0.498 (0.442)	-0.440 (0.445)	-0.429 (0.447)
Constant	1.302** (0.383)	-3.144** (1.170)	-3.189** (1.164)	-3.216** (1.172)	-3.215** (1.171)
Observations	2,096	2,096	2,096	2,096	2,050
Log Likelihood	-1,148.046	-1,139.058	-1,140.888	-1,138.519	-1,116.835
Akaike Inf. Crit.	2,378.092	2,362.115	2,361.776	2,363.037	2,319.670

Note:

+ p<0.1; * p<0.05; ** p<0.01

Figure 1 below shows the results of model 4 above. The figure shows the marginal effect of the treatment at the means of the covariates.

Figure 1. Repayment rates in treatment and control



Primary outcome 2: Amount paid back (or agreed to be paid back) per invoice sent. Table 3 below shows the result of an OLS regression with log of debt repaid (or agree to be repaid) as the dependent variable.

- Column 1 shows the exact model specified in the TP.
- Column 2 adds the (censored) debt maturity which is the number of days from invoice being received to the 16th of August or 45 days, whichever is lower.
- Column 3 drops the fixed effect for “reason for overpayment” and instead includes a fixed effect for whether a customer is previously advised or not, this should be included given the imbalance in treatment and control for this group.
- Column 4 runs the same specification as column 3 but with “reason for overpayment” added back in.
- Column 5 runs the same specification as column 4 but on the dataset after it has been pre-processed using a CEM matching algorithm and observations are weighted according to the CEM weights.

Table 3: Amount agreed to be repaid

	Dependent variable:				
	Amount agreed to be repaid (log)				Matched data (5)
	TP exact (1)	Debt maturity (2)	Prev advised drop reason (3)	Prev advised and reason (4)	
treatment	0.217 ⁺ (0.130)	0.226 ⁺ (0.129)	0.217 ⁺ (0.130)	0.223 ⁺ (0.130)	0.208 (0.131)
ReasonForOverpaymoved out of the above address	-0.342 (0.220)	-0.316 (0.219)		-0.320 (0.219)	-0.331 (0.217)
ReasonForOverpayother	0.106 (0.325)	0.288 (0.328)		0.290 (0.328)	0.326 (0.330)
ReasonForOverpayPreviously advised	-0.350 ⁺ (0.195)	-0.365 ⁺ (0.194)		-0.330 (0.215)	-0.342 (0.230)
PrevAdvisedTrue			-0.159 (0.154)	-0.063 (0.172)	-0.100 (0.182)
days_from_inv_censored		0.079 ^{**} (0.021)	0.076 ^{**} (0.021)	0.079 ^{**} (0.021)	0.081 ^{**} (0.021)
Month2	-0.037 (0.279)	-0.031 (0.278)	-0.050 (0.278)	-0.030 (0.278)	-0.074 (0.272)
Month3	0.129 (0.259)	0.129 (0.259)	0.114 (0.261)	0.142 (0.261)	0.131 (0.259)
Month4	0.482 ⁺ (0.286)	0.490 ⁺ (0.285)	0.497 ⁺ (0.292)	0.515 ⁺ (0.293)	0.589 ⁺ (0.293)
Month5	-0.663 ^{**} (0.257)	-0.660 ^{**} (0.256)	-0.662 [*] (0.262)	-0.638 [*] (0.263)	-0.596 [*] (0.262)
Month6	-0.691 ^{**} (0.246)	-0.685 ^{**} (0.245)	-0.679 ^{**} (0.253)	-0.662 ^{**} (0.253)	-0.672 ^{**} (0.252)
Month7	-1.420 ^{**} (0.273)	-0.058 (0.453)	-0.098 (0.455)	-0.037 (0.457)	-0.037 (0.459)
Month8	-2.343 ^{**} (0.281)	0.703 (0.858)	0.645 (0.859)	0.733 (0.862)	0.728 (0.873)
Month12	-0.377 (0.760)	-0.408 (0.758)	-0.335 (0.755)	-0.411 (0.758)	-0.419 (0.723)
customer.number.debts	-0.319 ^{**} (0.089)	-0.314 ^{**} (0.089)	-0.307 ^{**} (0.088)	-0.314 ^{**} (0.089)	-0.361 ^{**} (0.119)
Benefit_Officer_Num_2	-0.975 ⁺ (0.508)	-0.947 ⁺ (0.506)	-0.943 ⁺ (0.506)	-0.951 ⁺ (0.507)	-0.988 ⁺ (0.508)
Benefit_Officer_Num_3	-0.929 ⁺ (0.510)	-0.898 ⁺ (0.508)	-0.859 ⁺ (0.507)	-0.891 ⁺ (0.509)	-1.092 ⁺ (0.512)
Benefit_Officer_Num_4	-0.091 (0.511)	-0.017 (0.510)	-0.047 (0.510)	-0.023 (0.511)	-0.064 (0.512)
Benefit_Officer_Num_5	-0.560 (0.549)	-0.459 (0.548)	-0.550 (0.546)	-0.462 (0.548)	-0.455 (0.549)
Benefit_Officer_Num_6	-0.625 (0.527)	-0.609 (0.526)	-0.622 (0.526)	-0.610 (0.526)	-0.609 (0.525)
Benefit_Officer_Num_7	-0.576 (0.511)	-0.511 (0.509)	-0.582 (0.509)	-0.511 (0.509)	-0.591 (0.510)
Benefit_Officer_Num_8	-0.530 (0.546)	-0.472 (0.544)	-0.506 (0.545)	-0.487 (0.546)	-0.560 (0.547)
Benefit_Officer_Num_9	-0.198 (0.587)	-0.179 (0.586)	-0.179 (0.585)	-0.184 (0.586)	-0.386 (0.589)
Benefit_Officer_Num_10	-1.164 [*] (0.484)	-1.163 [*] (0.482)	-1.142 [*] (0.481)	-1.164 [*] (0.483)	-1.233 [*] (0.486)
Benefit_Officer_Num_11	-0.338 (0.592)	-0.245 (0.591)	-0.371 (0.589)	-0.252 (0.591)	-0.316 (0.599)
Benefit_Officer_Num_12	0.032 (0.563)	-0.034 (0.562)	-0.094 (0.562)	-0.035 (0.562)	-0.017 (0.563)
Benefit_Officer_Num_13	0.055 (0.593)	0.046 (0.591)	0.039 (0.590)	0.047 (0.591)	0.116 (0.592)
Benefit_Officer_Num_14	-0.821 (0.611)	-0.786 (0.609)	-0.775 (0.608)	-0.771 (0.611)	-0.876 (0.632)
Benefit_Officer_Num_15	0.545 (0.702)	0.572 (0.699)	0.578 (0.699)	0.577 (0.700)	0.712 (0.720)
Benefit_Officer_Num_16	0.060 (0.523)	0.094 (0.521)	0.209 (0.521)	0.115 (0.524)	-0.009 (0.535)
Benefit_Officer_Num_17	-0.365 (0.561)	-0.338 (0.559)	-0.451 (0.557)	-0.342 (0.559)	-0.373 (0.560)
Benefit_Officer_Num_18	0.224 (0.520)	0.262 (0.519)	0.244 (0.518)	0.260 (0.519)	0.293 (0.521)
Benefit_Officer_Num_19	0.753 (0.612)	0.796 (0.610)	0.734 (0.610)	0.798 (0.610)	1.256 [*] (0.616)
Benefit_Officer_Num_20	-0.197 (0.527)	-0.199 (0.525)	-0.270 (0.525)	-0.202 (0.525)	-0.105 (0.531)
Benefit_Officer_Num_21	-0.360 (0.426)	-0.321 (0.425)	-0.326 (0.425)	-0.322 (0.425)	-0.318 (0.427)
Benefit_Officer_Num_22	-0.626 (0.548)	-0.532 (0.547)	-0.675 (0.539)	-0.532 (0.547)	-0.586 (0.560)
Benefit_Officer_Num_23	-0.066 (0.564)	-0.059 (0.563)	-0.018 (0.563)	-0.048 (0.564)	-0.174 (0.563)
Benefit_Officer_Num_24	-0.818 (0.566)	-0.850 (0.564)	-0.719 (0.567)	-0.820 (0.570)	-0.738 (0.585)
Benefit_Officer_Num_25	-0.439 (0.646)	-0.395 (0.644)	-0.464 (0.643)	-0.397 (0.645)	-0.586 (0.681)
Benefit_Officer_Num_26	-0.620 (0.555)	-0.602 (0.553)	-0.663 (0.553)	-0.606 (0.554)	-0.785 (0.552)
Benefit_Officer_Num_27	-0.397 (0.592)	-0.411 (0.590)	-0.528 (0.589)	-0.417 (0.591)	-0.416 (0.602)
Constant	3.031 ^{**} (0.446)	-0.628 (1.071)	-0.502 (1.058)	-0.634 (1.072)	-0.668 (1.080)
Observations	2,096	2,096	2,096	2,096	2,050
R ²	0.100	0.106	0.103	0.106	0.109
Adjusted R ²	0.083	0.088	0.087	0.088	0.091
Residual Std. Error	2.916 (df = 2056)	2.906 (df = 2055)	2.909 (df = 2057)	2.907 (df = 2054)	2.918 (df = 2008)
F Statistic	5.832 ^{**} (df = 39; 2056)	6.075 ^{**} (df = 40; 2055)	6.248 ^{**} (df = 38; 2057)	5.927 ^{**} (df = 41; 2054)	5.982 ^{**} (df = 41; 2008)

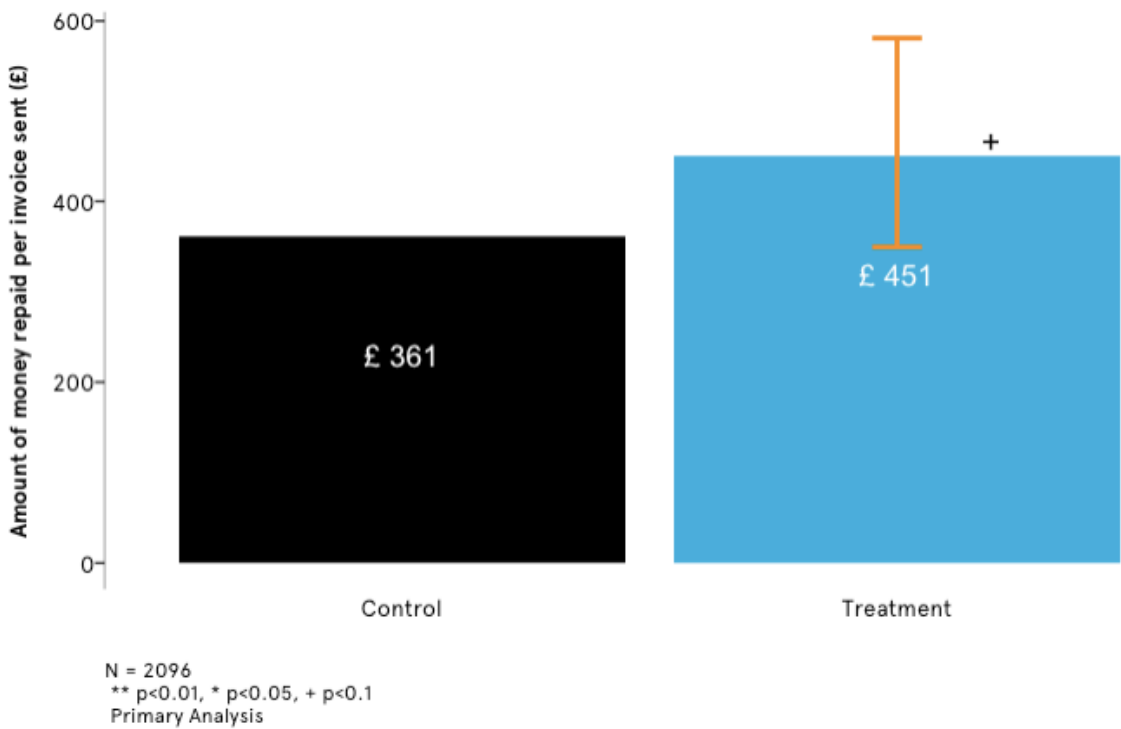
Note:

+ p<0.1; * p<0.05; ** p<0.01

We find evidence that the treatment led to a statistically significant increase in the amount of money that repaid or agree to be repaid per invoice sent.

Figure 2 below shows the marginal effect of the treatment on the amount of debt paid back (or agree to be paid back) per invoice sent. For reference, the mean value of an invoice sent is £2085. This result is statistically significant ($p = .08$) at the 10% level.

Figure 2. Amount repaid per invoice sent



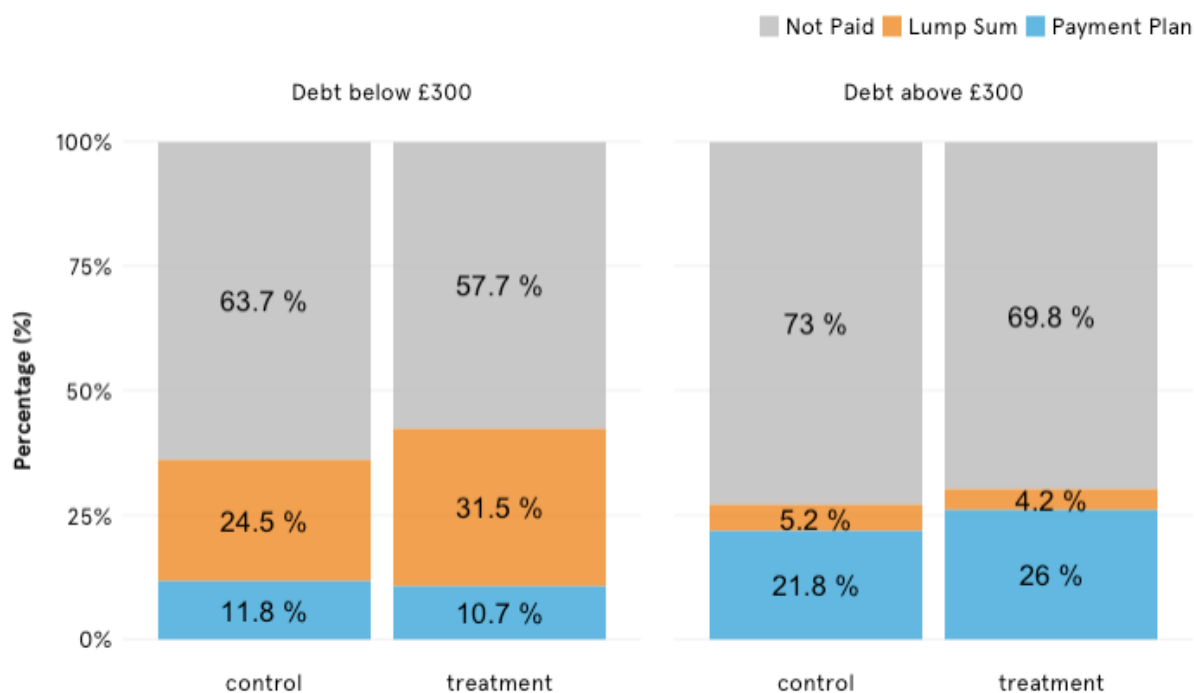
Secondary Analysis Findings

Secondary outcome 1: Likelihood of repayment via a payment plan, lump sum or not repaying.

This outcome was specified as a secondary outcome however I believe that this should be exploratory analysis. The reason being that we cannot disentangle whether an increase in the proportion of people paying via a lump sum is the result of people who wouldn't otherwise have paid back now paying back and choosing to do so in a lump sum, or if it is because those who were going to pay back anyway chose to do so through a lump sum because of the letters.

Figure 3 below shows the results of the multinomial regression split into high and low debt groups.

Figure 3. Repayment method by treatment and control for different debt sizes



The analysis (see table 4 below) reveals that for those with debts below £300 the treatment group are significantly more likely to repay via lump sum ($p = .03$) while the slight decrease in those paying via payment plan is not statistically significantly.

Conversely among those with debts above £300, those in the treatment group are significantly more likely to repay via a payment plan ($p = .046$) and the decrease in those paying via a lump sum did not significantly decrease.

Table 4: Repayment via Lump Sum or Payment Plan

	<i>Dependent variable:</i>	
	Pay in Lump Sum Debt below £300	Pay via Payment Plan Debt above £300
	(1)	(2)
treattreatment	0.074* (0.035)	0.044* (0.022)
PrevAdvisedTrue	-0.100* (0.049)	-0.002 (0.029)
LogDebt	-0.104** (0.022)	-0.014 (0.011)
ReasonForOverpaymoved out of the above address	0.077 (0.050)	-0.103* (0.042)
ReasonForOverpayother	0.149+ (0.083)	0.001 (0.057)
ReasonForOverpayPreviously advised	0.076 (0.060)	-0.035 (0.036)
days_from_inv_censored	0.001 (0.006)	0.013** (0.003)
Month2	-0.027 (0.072)	-0.029 (0.048)
Month3	0.051 (0.067)	0.009 (0.045)
Month4	0.155+ (0.080)	0.082 (0.050)
Month5	-0.068 (0.066)	-0.083+ (0.046)
Month6	-0.046 (0.065)	-0.113* (0.044)
Month7	-0.295* (0.125)	0.107 (0.078)
Month8	-0.289 (0.250)	0.233 (0.144)
Month12	-0.154 (0.217)	0.078 (0.125)
customer.number.debts	-0.068** (0.026)	-0.033* (0.015)
Benefit_Officer_Num_2	-0.205 (0.127)	-0.058 (0.088)
Benefit_Officer_Num_3	-0.265* (0.130)	-0.066 (0.088)
Benefit_Officer_Num_4	-0.187 (0.123)	0.045 (0.091)
Benefit_Officer_Num_5	-0.062 (0.150)	0.002 (0.093)
Benefit_Officer_Num_6	-0.212 (0.130)	-0.008 (0.092)
Benefit_Officer_Num_7	-0.155 (0.117)	-0.007 (0.095)
Benefit_Officer_Num_8	-0.281* (0.138)	0.053 (0.095)
Benefit_Officer_Num_9	0.042 (0.198)	-0.018 (0.097)
Benefit_Officer_Num_10	-0.230+ (0.132)	-0.093 (0.083)
Benefit_Officer_Num_11	-0.226 (0.162)	0.058 (0.100)
Benefit_Officer_Num_12	-0.078 (0.139)	0.012 (0.099)
Benefit_Officer_Num_13	-0.019 (0.152)	0.017 (0.102)
Benefit_Officer_Num_14	-0.369* (0.154)	0.021 (0.107)
Benefit_Officer_Num_15	0.034 (0.178)	0.087 (0.121)
Benefit_Officer_Num_16	-0.043 (0.141)	0.056 (0.090)
Benefit_Officer_Num_17	-0.199 (0.131)	0.021 (0.101)
Benefit_Officer_Num_18	-0.021 (0.125)	0.063 (0.092)
Benefit_Officer_Num_19	-0.227 (0.178)	0.168 (0.102)
Benefit_Officer_Num_20	-0.003 (0.134)	0.004 (0.091)
Benefit_Officer_Num_21	-0.159 (0.104)	0.0001 (0.075)
Benefit_Officer_Num_22	-0.236 (0.145)	-0.007 (0.094)
Benefit_Officer_Num_23	-0.205 (0.146)	0.068 (0.097)
Benefit_Officer_Num_24	0.016 (0.154)	-0.078 (0.097)
Benefit_Officer_Num_25	-0.233 (0.188)	-0.028 (0.107)
Benefit_Officer_Num_26	-0.167 (0.146)	0.009 (0.095)
Benefit_Officer_Num_27	-0.203 (0.142)	-0.060 (0.105)
Constant	0.894** (0.327)	-0.177 (0.197)
Observations	612	1,484
Log Likelihood	-310.841	-770.979
Akaike Inf. Crit.	707.682	1,627.959
<i>Note:</i> + p<0.1; * p <0.05; ** p<0.01		

Secondary outcome 2: Repayment after the first notification letter. This analysis measured whether those in the treatment group were more likely to repay after just receiving the first notification letter. We do not find a significant increase in the likelihood of repayment after the first letter. Table 5 details the results of this analysis.

Table 5: Repayment after first letter (within 15 days)

	<i>Dependent variable:</i>
	Pay after first letter (within 15 days)
treattreatment	0.220 (0.136)
PrevAdvisedPreviously Advised	-0.302 (0.198)
ReasonForOverpaymoved out of the above address	-0.115 (0.222)
ReasonForOverpayother	0.556 (0.352)
ReasonForOverpayPreviously advised	-0.032 (0.245)
days_from_inv_censored	0.090** (0.032)
LogDebt	-0.065 (0.043)
Month2	0.086 (0.251)
Month3	-0.115 (0.245)
Month4	0.218 (0.268)
Month5	0.001 (0.247)
Month6	-0.390 (0.245)
Month7	0.699 (0.503)
Month8	-13.481 (430.404)
Month12	-0.600 (0.791)
customer.number.debts	-0.397** (0.132)
Benefit_Officer_Num_2	0.349 (0.512)
Benefit_Officer_Num_3	-0.102 (0.550)
Benefit_Officer_Num_4	0.497 (0.508)
Benefit_Officer_Num_5	0.336 (0.571)
Benefit_Officer_Num_6	0.077 (0.541)
Benefit_Officer_Num_7	0.021 (0.539)
Benefit_Officer_Num_8	-0.556 (0.632)
Benefit_Officer_Num_9	0.386 (0.579)
Benefit_Officer_Num_10	-0.046 (0.530)
Benefit_Officer_Num_11	0.052 (0.642)
Benefit_Officer_Num_12	0.322 (0.576)
Benefit_Officer_Num_13	-0.053 (0.641)
Benefit_Officer_Num_14	0.434 (0.655)
Benefit_Officer_Num_15	0.691 (0.660)
Benefit_Officer_Num_16	0.452 (0.523)
Benefit_Officer_Num_17	0.887 (0.560)
Benefit_Officer_Num_18	0.623 (0.522)
Benefit_Officer_Num_19	-0.073 (0.682)
Benefit_Officer_Num_20	0.603 (0.518)
Benefit_Officer_Num_21	0.237 (0.440)
Benefit_Officer_Num_22	-0.525 (0.677)
Benefit_Officer_Num_23	0.577 (0.550)
Benefit_Officer_Num_24	-0.048 (0.641)
Benefit_Officer_Num_25	-0.076 (0.748)
Benefit_Officer_Num_26	0.107 (0.554)
Benefit_Officer_Num_27	0.162 (0.612)
Constant	-5.508** (1.558)
Observations	2,096
Log Likelihood	-746.084
Akaike Inf. Crit.	1,578.168
Note:	+ p<0.1; * p <0.05; ** p<0.01

Secondary outcome 3: instalment amount. This analysis measures whether the monthly instalment amounts for those re-paying via a payment plan was higher among those that received the treatment letters. This is because the figure of £80 is used which we thought may act as a higher anchor.

The analysis does not find a statistically significant increase in the monthly amount repaid see table 6 below. However, it does appear that more people are paying in a monthly instalment of £80 see density plot in exploratory analysis below.

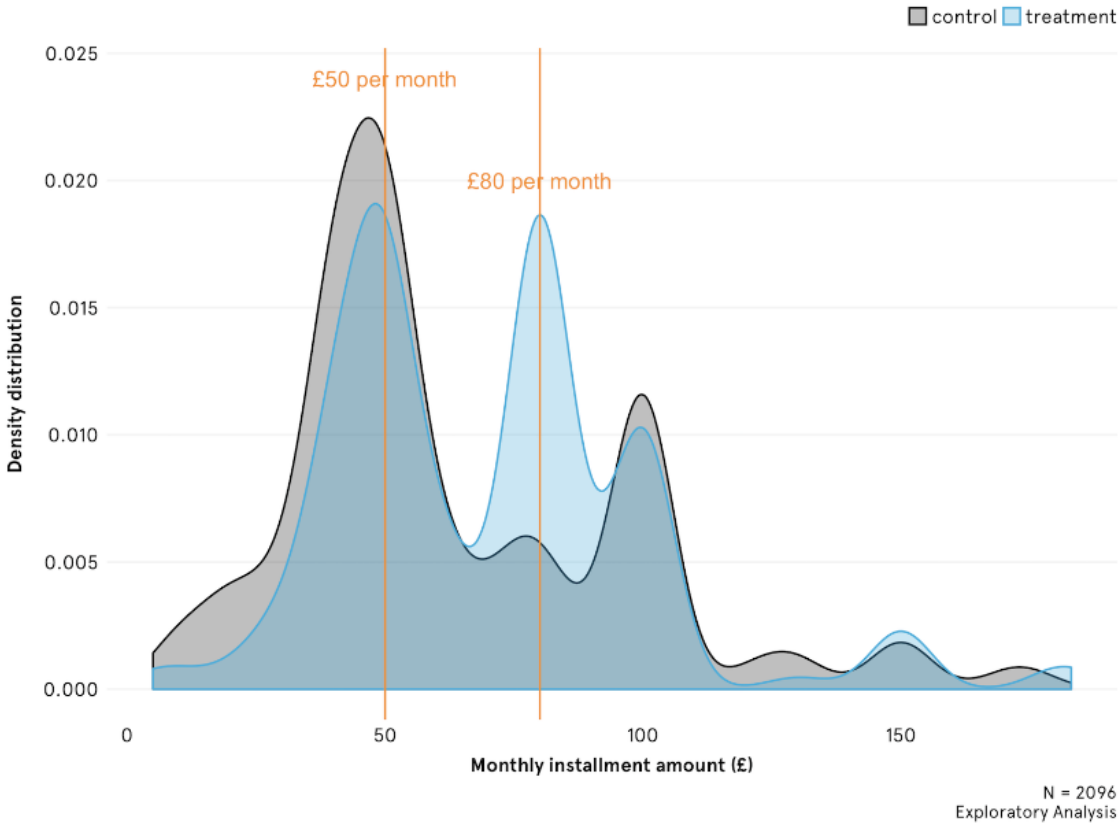
Table 6: Installment amount log (£ per month)

	Dependent variable: log(installment.amount)
treattreatment	0.101 (0.079)
PrevAdvisedPreviously Advised	-0.131 (0.112)
ReasonForOverpaymoved out of the above address	-0.096 (0.155)
ReasonForOverpayother	0.171 (0.219)
ReasonForOverpayPreviously advised	0.047 (0.143)
days_from_inv_censored	-0.036* (0.016)
LogDebt	0.243** (0.036)
Month2	-0.019 (0.149)
Month3	0.004 (0.138)
Month4	0.164 (0.147)
Month5	-0.095 (0.156)
Month6	0.102 (0.147)
Month7	-0.168 (0.250)
Month8	-0.778 (0.707)
Month12	-0.765+ (0.389)
customer.number.debts	0.015 (0.073)
Benefit_Officer_Num_2	-0.101 (0.306)
Benefit_Officer_Num_3	-0.196 (0.303)
Benefit_Officer_Num_4	-0.201 (0.287)
Benefit_Officer_Num_5	-0.027 (0.337)
Benefit_Officer_Num_6	0.094 (0.281)
Benefit_Officer_Num_7	-0.013 (0.305)
Benefit_Officer_Num_8	-0.197 (0.299)
Benefit_Officer_Num_9	-0.156 (0.350)
Benefit_Officer_Num_10	-0.105 (0.302)
Benefit_Officer_Num_11	0.168 (0.331)
Benefit_Officer_Num_12	0.031 (0.318)
Benefit_Officer_Num_13	0.155 (0.342)
Benefit_Officer_Num_14	0.577 (0.517)
Benefit_Officer_Num_15	0.058 (0.402)
Benefit_Officer_Num_16	-0.365 (0.274)
Benefit_Officer_Num_17	-0.210 (0.345)
Benefit_Officer_Num_18	-0.213 (0.302)
Benefit_Officer_Num_19	-0.069 (0.304)
Benefit_Officer_Num_20	-0.126 (0.302)
Benefit_Officer_Num_21	0.006 (0.246)
Benefit_Officer_Num_22	-0.365 (0.321)
Benefit_Officer_Num_23	-0.047 (0.304)
Benefit_Officer_Num_24	0.129 (0.348)
Benefit_Officer_Num_25	-0.411 (0.341)
Benefit_Officer_Num_26	0.077 (0.296)
Benefit_Officer_Num_27	-0.146 (0.397)
Constant	4.140** (0.772)
Observations	312
R ²	0.258
Adjusted R ²	0.142
Residual Std. Error	0.634 (df = 269)
F Statistic	2.226** (df = 42; 269)
Note:	+ p<0.1; * p <0.05; ** p<0.01

Note: the following figure is really exploratory analysis however it is kept in this section because it follows naturally from the analysis above. The figure below shows the distribution of monthly instalment amounts for those in the treatment and control groups for those that choose to repay via a payment plan. This figure

shows the bunching around the figure of £80 among those in the treatment group.ⁱ
This figure should only be used to illustrate some evidence of an anchoring effect.

Figure 4. Monthly instalment amount in treatment and control



ⁱ Note: Due to the skewed distribution, this figure does not include instalments above £200 per month (7% of instalments)

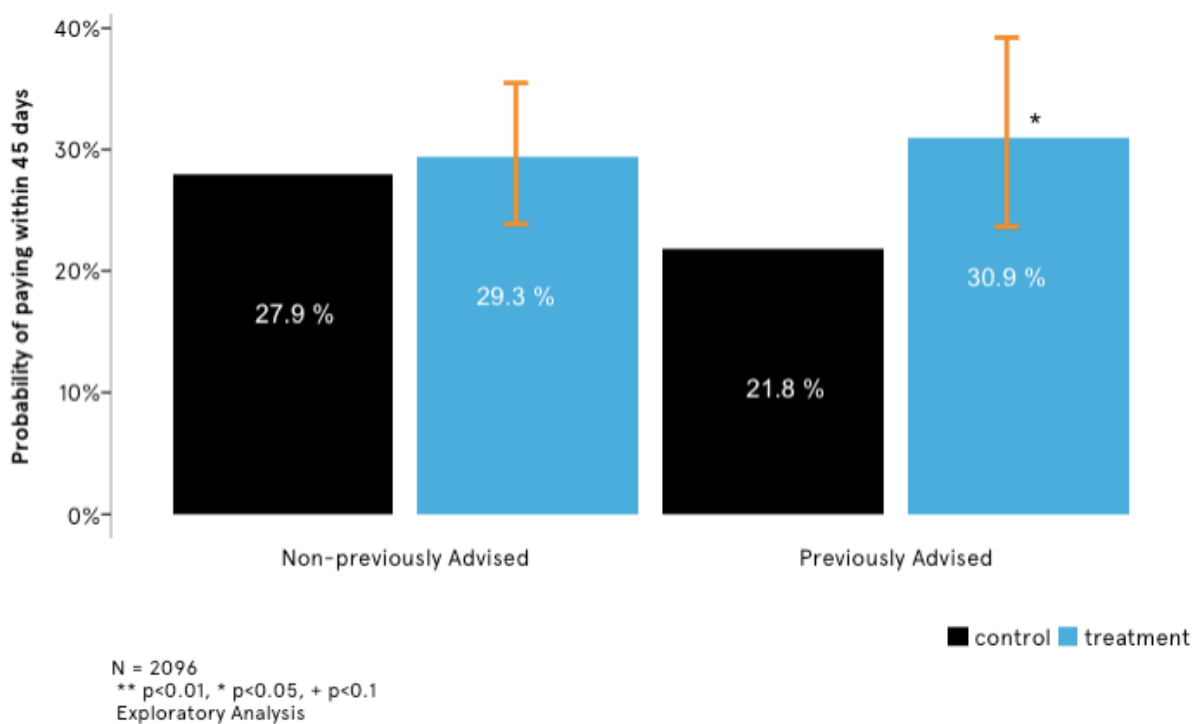
Exploratory Analysis Findings

The exploratory analysis investigates two areas: firstly, a differential effect on previously advised or non-previously advised customers and secondly a differential effect across different income levels.

Differential effect on customer type: The first part of the exploratory analysis examines whether the treatment effect is different for previously advised or non-previously advised customers.

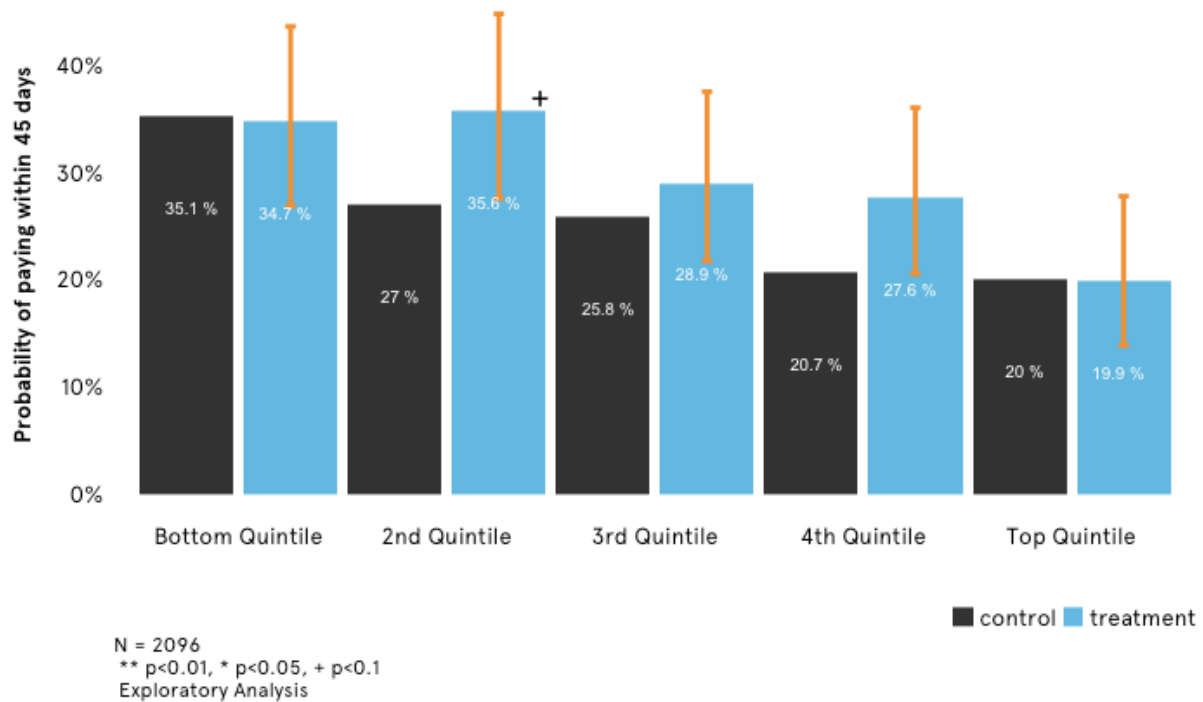
The figure below shows that there does appear to be a differential impact with the treatment being far more effective for previously advised customers.

Figure 5. Repayment rates by customer type



Differential effect on debt size: The figure below shows the difference between repayment rates in the treatment and control groups across quintiles of debt size.

Figure 6. Repayment rates across quintiles of debt amount



It appears that for customers with low debts (bottom quintile) and high debts (top quintile) there is no treatment effect but for customers with medium sized debts there is a treatment effect. It should be noted that the only statistically significant difference is in the 2nd quintile.

Real World Impact

In order to estimate the impact of the trial we take the model used to measure primary outcome 1. We then estimate how much less would have been paid back in the treatment group had they actually received the control letters. This allows us to estimate how much more has been repaid as a result of the trial.

Table 7: Estimate of the real world impact

Increased amount repaid per invoice	£57 ^j
Size of treatment group	989
Total value brought forward	£56,000

Over the course of a year we estimate that Croydon would send invoices to roughly 3,720 eligible customers. This would equate to £212,000 brought forward during the year and £4,500 less spent recovering debts.^k The added annual cost of sending out the behavioural letters in colour would be £520.

The ultimate recovery rate of this debt in Croydon fluctuates between 55% and 60%.^l We cannot say whether the customers who responded to our treatment letters would ultimately have paid through the debt recovery process. However, it seems likely that a significant proportion of the £56,000 brought forward as a result of the trial would have otherwise ended up being written off.

Value for Money Analysis

In the value for money analysis I do not consider BIT time in the cost. The incremental cost of printing two colour pages per person in the treatment group is 14p per person (£138).

Table 8: Cost⁴²

Item	Cost
Printing letters in colour	£138
Total Cost:	£138

Table 9: Returns

Item	Return
Payments brought forward	£56,000
Total Returns:	£56,000

^j Note that this is lower than the figure of £90 quoted above. This is because the increase of 25% at the mean amount repaid (equivalent to £90) is higher than the average increase due to the right skewed distribution.

^k Croydon Council have estimated that the administrative cost of debt recovery comes to £34 per invoice

^l Information provided by Croydon, debt is written off after roughly 7 years.

Discussion

Discussion of results: We conclude that there is evidence that this intervention led to more customers paying back their HB overpayment either in a lump sum or payment plan within 45 days of receiving the invoice. The overall effect appears to be driven by a pronounced statistically significant effect in the “previously advised” customer group.

There is also evidence that the wording and content of the letters influence how people paid back. Customers with a debt below £300 were nudged towards paying back in a lump sum and customers with a debt above £300 were nudged towards paying with a payment plan. The analysis demonstrates that these customers were more likely to pay back in the method suggested by their respective letters and that they were not less likely to pay back in the opposite way.

There is no evidence that the behavioural letters led to any decreases in repayment rates for different customer groups at different debt balances. Therefore, our conclusion would be that these letters should be rolled out as the new business as usual letters.

The p-values for the primary and outcomes are significant at the 10% rather than the 5% level. This tells us that there is a higher risk of a false positive (we think there is an effect but in reality there isn't) than scientific convention would use to draw a robust positive conclusion. However, we can see the letters influence *how* people paid back with statistical significance at the 5% level. This adds weight to the evidence that the intervention did influence whether or not people paid back since and the results is less likely to be a false positive.

We would recommend rolling out this intervention for three reasons. Firstly, this is a low cost intervention with potential for a high return on investment. Secondly, there is no evidence that it had a negative effect on any customer group's likelihood to repay. Finally, there is strong evidence to suggest a positive effect on at least some customer groups and moderate evidence of a positive effect across all customer groups and debt amounts.

Endnotes

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² These are customers who used to have their HBOP directly deducted from their benefits until a recent change in their circumstances (e.g. a change in income).

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