

Applying behavioral insights to increase food waste recycling in Wigan

Final report

November 2018





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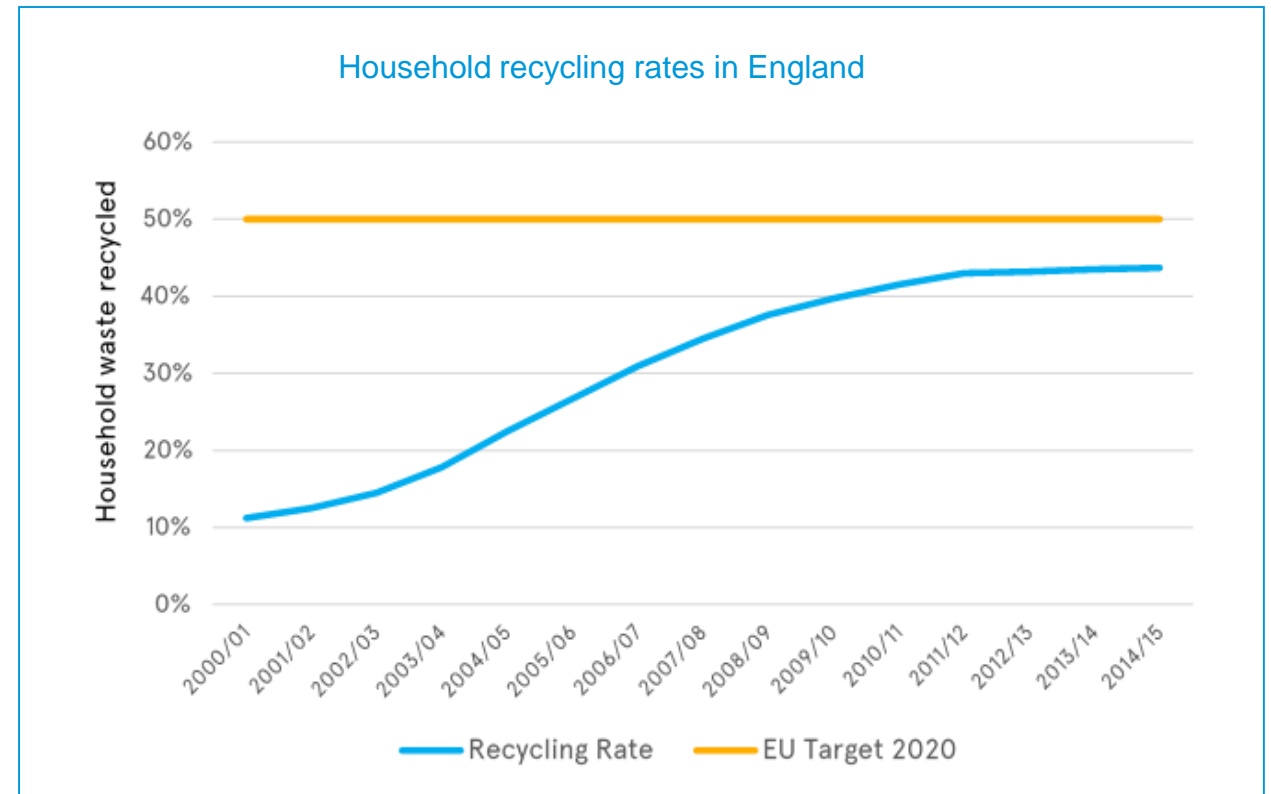
Introduction: Project overview & goals

- The goal: Increase recycling in Wigan
- The approach: The TESTS framework

The goal: Increase recycling in Wigan



- Recycling rates in England increased dramatically from 2000-2010. However, more recently they appear to be plateauing below the EU target level of 50% by 2020 (and well below the new 65% target by 2035, which many commentators expect to remain in place post-Brexit).
- Wigan's recycling is around the national average, although it has a higher rate if population characteristics are taken into account. However, it is also still below the 50% target.





The approach: The TESTS framework

This project was delivered using BITs TESTS framework.

Target & Explore

In these stages, we used desk-based research, fieldwork and collaboration with Wigan Council to answer two core questions:

- **What specific recycling behaviours should we concentrate on changing?**
- **What are the barriers to those behaviours?**
- **How will we measure if we have been successful?**

Solution

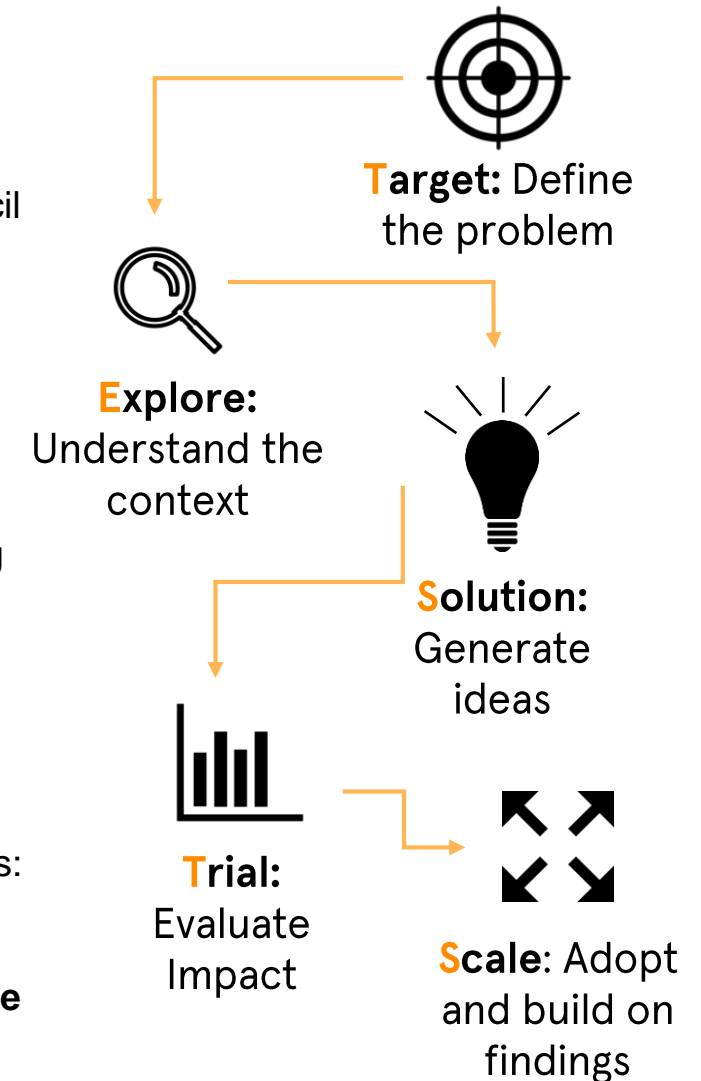
In this stage, we drew on the findings from our Explore phase and the broader behavioural science evidence base to develop an intervention to encourage households to begin recycling their food waste. In the solution phase, we answered the questions:

- **What behavioral levers can we use to get people to begin recycling?**
- **How can we introduce our intervention in a feasible and cost-effective way?**

Trial & Scale

In these stages, we implemented our intervention and tested the results using a mixed methods approach (with several evaluations built into a single pilot). This allowed us to assess:

- **What messages are most effective at getting people to consider starting to recycle their food waste?**
- **Once we have initial interest, was our intervention successful at helping people to start building a food recycling habit?**
- **What did we learn, and how can we apply it in future work?**





Section One: Target and Explore

Assessing the context and identifying barriers to recycling

- Overview
- Methods
- Findings



Target & Explore: Overview

- At this stage in the project, our goal was to answer three questions:
 - **Where are the biggest opportunities to increase recycling rates?**
 - **What are the barriers in the way?**
 - **How will we measure any improvement in recycling rates?**
- Our methods included a review of the literature on recycling (later concentrating on food recycling), interviews and fieldwork with Wigan staff, an analysis of existing administrative data & surveys and interviews with residents.
- In the following slides, we present more detail about our methods, and summarize our research findings.



Target & Explore: What we did



Understanding the resident perspective

- Interviews with residents at two community events.
- An online survey with 50 GM residents to test their understanding of waste and recycling rules
- Telephone interviews with residents who had recently ordered a food caddy



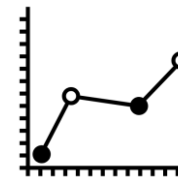
Understanding the council perspective

- Interviews with Council staff from waste, housing and related services.
- Two days shadowing bin collection rounds and waste audits
- Four workshops with Wigan staff to develop and refine ideas



Secondary research

- Reviewed the evidence base on waste and recycling
- This included behavioral science literature on increasing recycling and relevant behavioural findings from other domains
- We later concentrated on food waste recycling



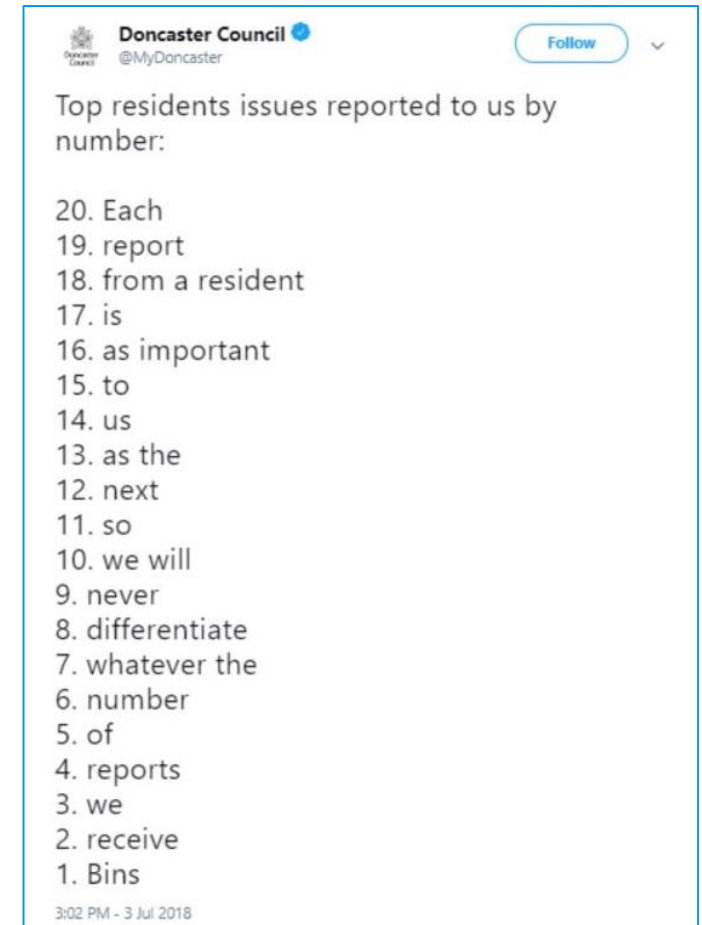
Data

- Exploratory analysis of Wigan's internal recycling data.
- Review of national data on waste and recycling trends.



Findings: What did we find in our general fieldwork?

- Waste and recycling can be a surprisingly **controversial topic**.
- Bin crews are **enthusiastic**, but they **have a time-sensitive job to do**. Any changes need to be easy to administer and require careful thought about the logistics.
- **Existing household-level data is not consistent or reliable** (e.g. contamination, non-presentation and availability of recycling bins). For example, a handful of crews are responsible for the overwhelming majority of contamination reports. Self-reported surveys also consistently over-report recycling rates.
- **People generally understand the recycling rules** (although there is some confusion about the details on plastics and food).
- **There is mismatch between why people say *they* started recycling and why they think *others* do or don't recycle**. Most people begin recycling because of some outside prompt (changes to collections or moving house for example). However, they think most other people begin recycling for environmental reasons, or don't recycle because of laziness.





Findings: What did we find on food waste?

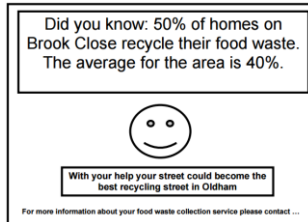
- Most people recycle dry items (paper, plastics, glass and tins). **However, rates seem much lower for food recycling.** This pattern shows up in self-reported surveys. Food waste is also one of the most common recyclable materials found in waste which is being sent to landfill. As a result, we decided to narrow the project down to focus on this specific form of recycling.
- There is indicative evidence that **many people in Wigan still don't realise that they can recycle food waste.** For example, lots of households ordered a food caddy in Autumn 2017 when collection schedules changed and they realized that food recycling was available.
- **Two key barriers** to food recycling come up repeatedly in the policy literature: **the 'yuck factor'** and a belief that households **don't produce enough food waste for it to be worth recycling.** People who don't yet recycle their food see these as bigger barriers than those who do.
- Food waste recycling is **lower in areas with transient populations, in poorer areas and among younger people.**¹





Findings: What has been tried before

We found that a range of behavioural approaches have been tried before (in the UK and internationally):



Feedback can be effective but it requires detailed data (which often isn't available)

Both personal feedback (telling households about their own recycling performance) and social feedback (telling households how they compare to their neighbours) have increased recycling.² However, you need street-level (or ideally household level) information.



Timely prompts have an encouraging evidence base

Stickers directly onto bins have been successful in several areas.³ A BIT trial providing feedback when bins were not presented increased the likelihood that households put their recycling out in future collections.⁴



There is mixed evidence for the role of incentives

Lotteries to encourage recycling and discourage contamination have been effective.⁵ Incentive schemes (like points-based systems) have a more mixed record.⁶



Changing attitudes and providing information is expensive and may not be that effective

Doorstepping campaigns have mixed results (and effects may diminish over time).⁷ School-based campaigns and informational leaflets to households don't appear to be effective.⁸



Section Two: Solution design




Developing a behaviorally-informed intervention

- Overview
- End-to-end process
- Three key stages in detail



Solution overview:

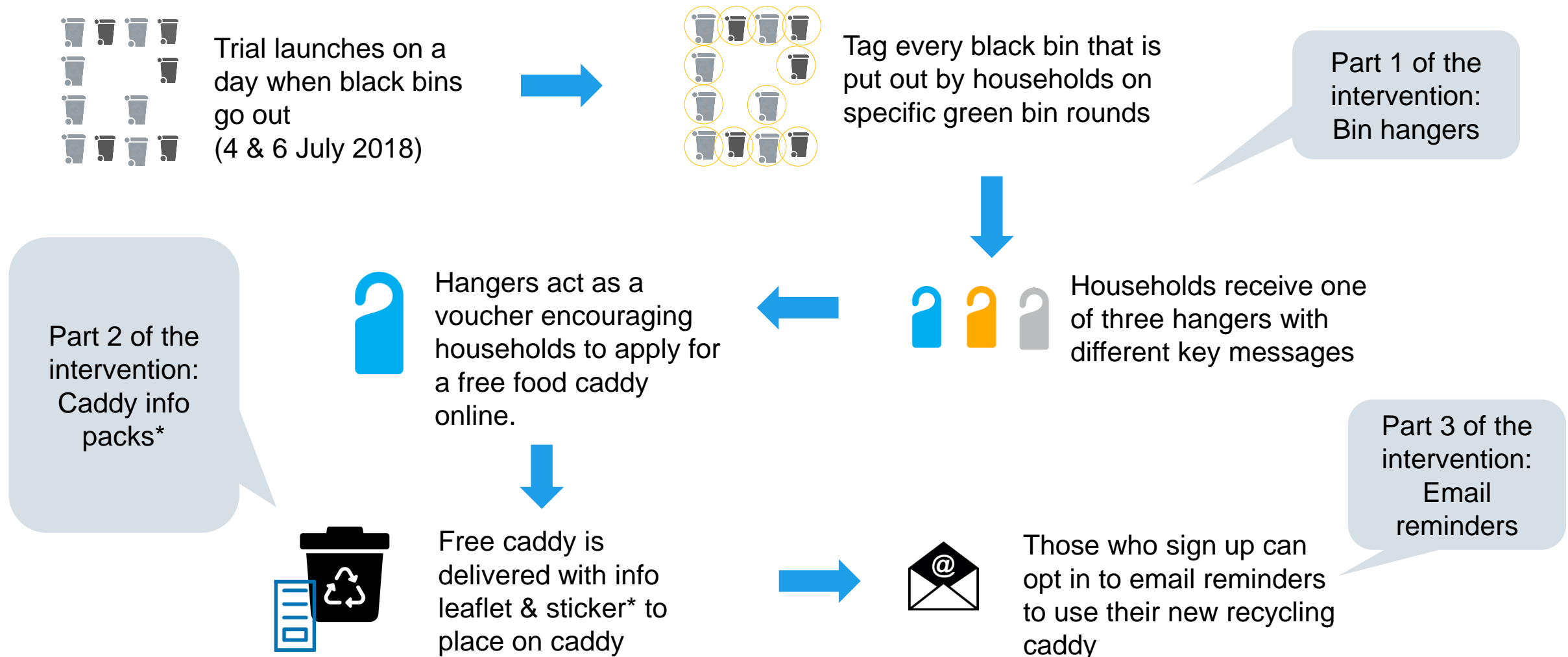
The solution acts at the *round level* and is designed to be *easily replicable* on other rounds if successful

Component	Description	Barriers addressed
 Bin hangers	Tagging all black bins on a target round with a door hanger featuring a message prompting people to request a new food caddy if they don't have one.	Many people do not realise they can recycle food waste. Tagging bins as a timely reminder has helped change behaviour in other contexts
 Caddy info pack	If people order a caddy, they will receive an information leaflet and caddy sticker to tackle key information gaps.	There is some confusion about what foods can and cannot be recycled.
 Email reminders	If people order a caddy, they have the option to sign up for timely email reminders for a limited time after the caddy is delivered to encourage people to start recycling.	Food recycling is a habit. One way to help people start a new habit is to send them timely reminders.

The following slides outline each step in detail.



Detailed end-to-end process of our suggested intervention





Part 1: Bin hangers

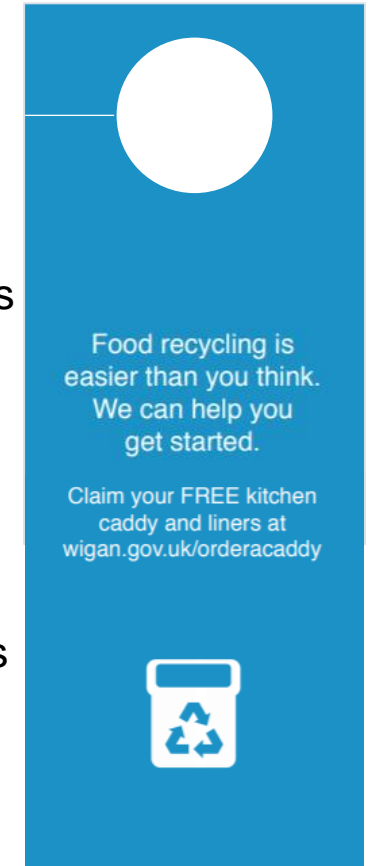
This hanger tackles a specific barrier which is highlighted in policy research – letting people know even small amounts of food recycling are valuable



This hanger draws on social norms. The hypothesis is that letting people know how prevalent food recycling is may encourage them to act



This hanger emphasises how easy it is to get started. This draws on both general behavioural principles and recycling-specific research which highlights the potential hassle as a barrier to food recycling



Part 1: Bin hangers in action



Part 2*: New, behaviourally-informed leaflet (outside)



TIPS

TO MAKE FOOD RECYCLING EASY

A good place to put your caddy is on your kitchen worktop. This makes it easy to remember to use it.



Get free refills of compostable liners by tying an empty one to your green bin handle.



Place the enclosed sticker on your caddy as a reminder of what can be recycled.



The Deal

Visit www.wigan.gov.uk/foodcaddies for more information

HOW TO

Wigan Council

RECYCLE FOOD

- 1 Line caddy with compostable liners



- 2 Place food waste into caddy



- 3 Tie food waste bag and place in green bin



Tips designed to tackle some key potential barriers:

1. People forget to begin using the caddy
2. People stop recycling when they run out of compostable bags

Part 2*: New, behaviourally-informed leaflet (inside)



Simple, easy to understand information on the common food waste items that can be recycled (including those, like meat and bones) people don't always know about

DO
RECYCLE THESE ITEMS
Wigan Council

Meat and bones	Fish	Bread and pastries
Cheese	Eggs and egg shells	Pasta and rice
Fruit and vegetables	Tea bags and coffee grounds	Food leftovers

DON'T
RECYCLE THESE ITEMS
Wigan Council

Milk, yogurt or cream	Liquids	Cooking oil
Soil and rubble	Food packaging	Regular plastic bags and bin liners

Protect our farms by keeping these items out of your green bin

Food waste from your kitchen caddy and green bin is used as compost on British farms

The Deal Visit www.wigan.gov.uk/foodcaddies for more information

Simple, easy to understand information on which items households shouldn't recycle (and a clear message about why)



Part 2*: New, behaviourally-informed materials (sticker)



A small sticker that people could put directly onto their kitchen caddy. This concentrates on reminding people about the most important, and least well-remembered, materials that can be recycled.



Part 3: Reminder emails

We also allowed households to opt in to receiving a series of three reminder emails (we wanted to send these to all households who ordered a caddy, but could not because of GDPR rules)

These were sent in the weeks after the household received a caddy. They functioned as a reminder to begin using the caddy and provided hints and tips to get people started.

Sent two days after caddy is delivered

Subject: Your new kitchen caddy for recycling food

A kitchen caddy makes it easy to collect food waste in your kitchen before putting it in your green bin.

Learn more about using your kitchen caddy [here](#)

TIP: Place your caddy on your kitchen worktop to help you remember to recycle your food waste

Sent first or second Sunday after caddy is delivered

Subject: Can I recycle my leftover Sunday roast?

Did you know that meat (both raw and cooked) can be recycled as food waste?

You can also put bones and fish in your kitchen caddy & green bin.

Learn more about which foods can be recycled [here](#)

TIP: Get free replacement caddy liners by tying one of the liners round the handle of your Green Bin when leaving it out for collection

Sent just before the first green waste collection after caddy is delivered



Subject: Remember to put out your Green Bin tomorrow

Food waste will be collected in your area tomorrow. Remember to put out your Green Bin.

We want your food waste. No amount is too small!

Learn more about why food recycling is important [here](#)

TIP: Set a reminder in your phone to put out your Green Bin on [collection day](#) every fortnight



Section Three: Trial & Scale

- Overview
- Trial 1 results: Does the whole process increase food recycling?
- Trial 2 results: Did the hangers increase caddy orders?
- Trial 3 results: Which hanger is most effective?
- What did we learn, and what do we recommend Wigan does next?

Note: For a detailed explanation of analysis methods, see Annex A



Trial & Scale: Overview

- In this phase, we applied rigorous evaluation methods to answer three questions:
 - **What can we say about the impact of our intervention overall?** Did the full end-to-end process increase food waste recycling on our target rounds?
 - **Did our hangers increase kitchen caddy orders?** How did the number of orders in our target rounds compare to the number of orders elsewhere in Wigan?
 - **Which message was most effective?** Which of our hangers was most effective at getting people to order a caddy?
- In the following slides, we summarize our findings and set out our recommended next steps

Note: A detailed explanation of analysis methods (and some implementation challenges we faced) can be found in Annex A.



What we did

- We tested our new intervention on two rounds in Wigan: A2GW6Wed and A2GW6Fri. These rounds were chosen because of their historically low levels of food recycling and because most households on those rounds seemed to have green bins. The bin tagging took place on 4 July & 6 July 2018.
- We collected the following data to answer our three research questions:
 1. **What can we say about the impact of our intervention overall?** To answer this question, we looked at the average weight collected over time on our two target rounds. This was compared to a weighted average of other rounds in Wigan (*known as a 'synthetic control'*) to approximate a similar historical trend line as the targeted rounds (*known as a 'difference-in-difference' analysis*)
 2. **Did our hangers increase kitchen caddy orders?** To answer this question we looked at the average number of caddys ordered over time on our two target rounds. This was compared to a weighted average of other rounds in Wigan (*known as a 'synthetic control'*) to approximate a similar historical trend line as the targeted rounds
 3. **Which hanger was the most effective?** To answer this question, we conducted a *randomised controlled trial* (RCT), which is a way to measure the impact of an intervention by randomising who gets a specific treatment. Households were randomly allocated to receive one of the three hangers. The three hangers each had their own URL to order caddies. We measured the number of caddy orders at each URL and used this to identify which hanger was the most effective.



Trial Results: Overview

3,643

Number of households who received a bin tag

138

Number of kitchen caddys ordered by houses in our target rounds

4.7%

Proportion of households who ordered a caddy after receiving our most effective tag (focused on social norms)

4.6%*

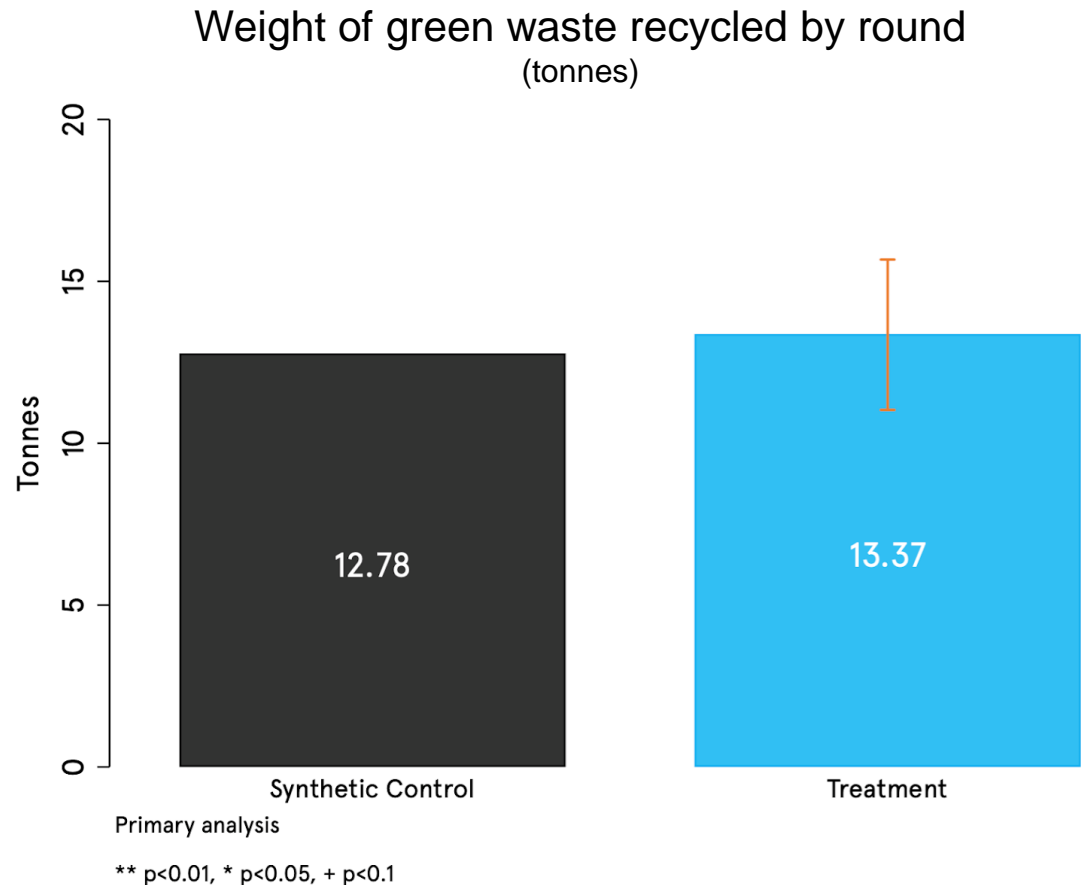
Increase in the weight of green waste collected on our target rounds

*This weight increase is not statistically significant



Trial 1: Did our overall intervention improve recycling rates?

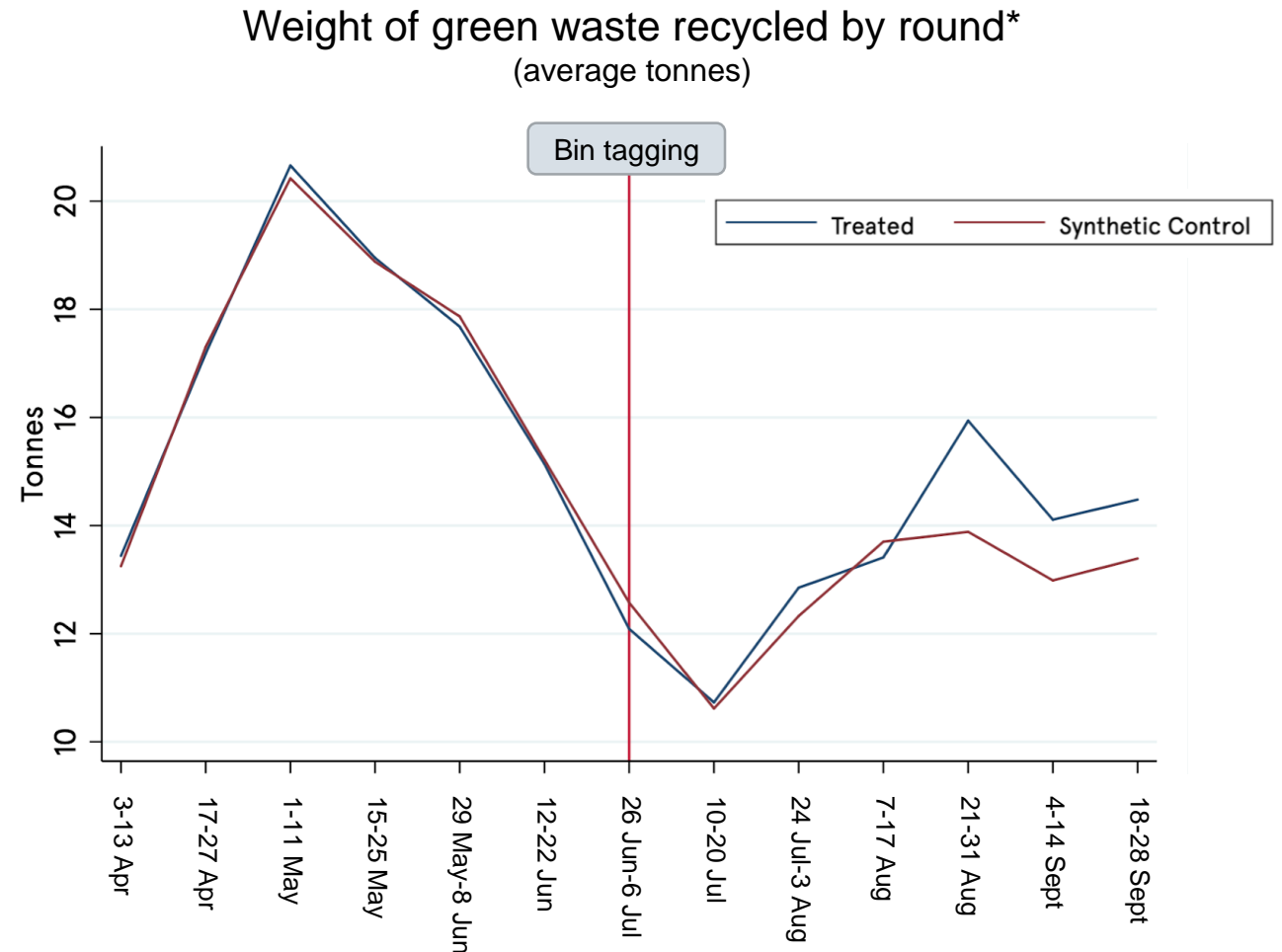
- The **increase in weight of green waste recycled on the targeted rounds is not statistically significant.** This means we cannot be sure that the tonnage difference between target rounds and control are due to our intervention, rather than chance fluctuation.
- Our target rounds recycled 0.59 tonnes more food waste than the control, a 4.6% increase in weight of food waste recycled.
- However, we still feel these **results are promising...**





Trial 1: Did our overall intervention improve recycling rates?

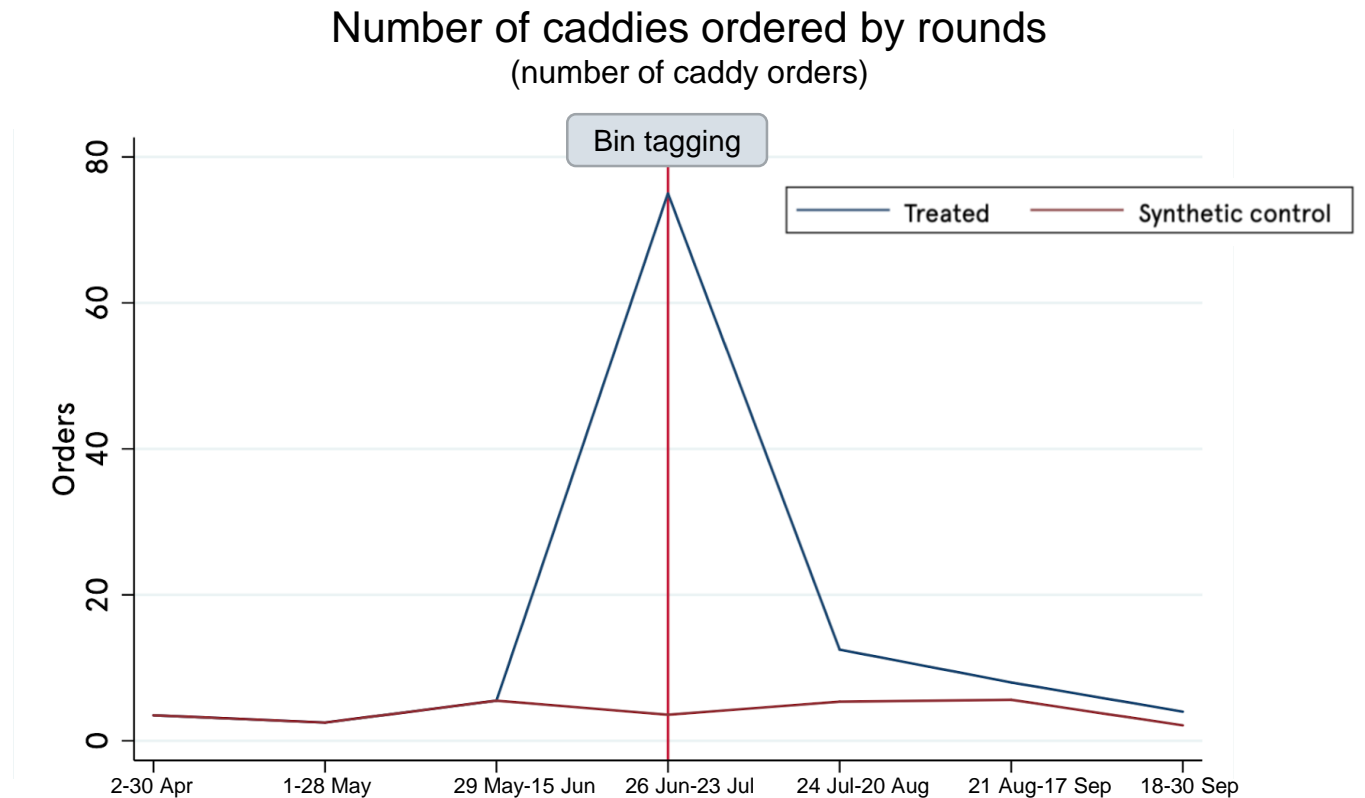
- Looking at weight of food waste recycled over time, we can see that the **trend line starts to diverge** around the fourth bin collection – nine weeks after tagging.
- A **lag before we see a change in tonnes recycled is expected**, given that households need to order & receive the caddy, as well as change their behaviour.
- So, while the difference on overall tonnage was not statistically significant, we believe **the trend line shows promising results.**





Trial 2: Did our hangers increase kitchen caddy orders?

- Our bin tagging **significantly increase the number of caddy orders** on our targeted rounds. It went from 5 caddy orders in the period prior to tagging, to 75 in the period following the tagging, a **1500% increase**.
- The drop off in caddy orders in late July suggests that most caddy orders were due to the tagging.
- Note that before the bin tagging, the number of orders in our target rounds and the control match so closely that the two lines overlap almost perfectly.





Trial 2: Almost half of those ordering a caddy signed up for emails

47%

Of those ordering a caddy signed up to emails

What people signed up to

I would like three emails with tips & reminders to help me get started using my caddy

*Majority sent out on
10 & 12 July*

Subject: Your new kitchen caddy for recycling food

A kitchen caddy makes it easy to collect food waste in your kitchen before putting it in your green bin.

Learn more about using your kitchen caddy [here](#)

TIP: Place your caddy on your kitchen worktop to help you remember to recycle your food waste

*Majority sent out on
29 July*

Subject: Can I recycle my leftover Sunday roast?

Did you know that meat (both raw and cooked) can be recycled as food waste?

You can also put bones and fish in your kitchen caddy & green bin.

Learn more about which foods can be recycled [here](#)

TIP: Get free replacement caddy liners by tying one of the liners round the handle of your Green Bin when leaving it out for collection

*Majority sent out on
9 & 21 August*

Subject: Remember to put out your Green Bin tomorrow

Food waste will be collected in your area tomorrow. Remember to put out your Green Bin.

We want your food waste. No amount is too small!

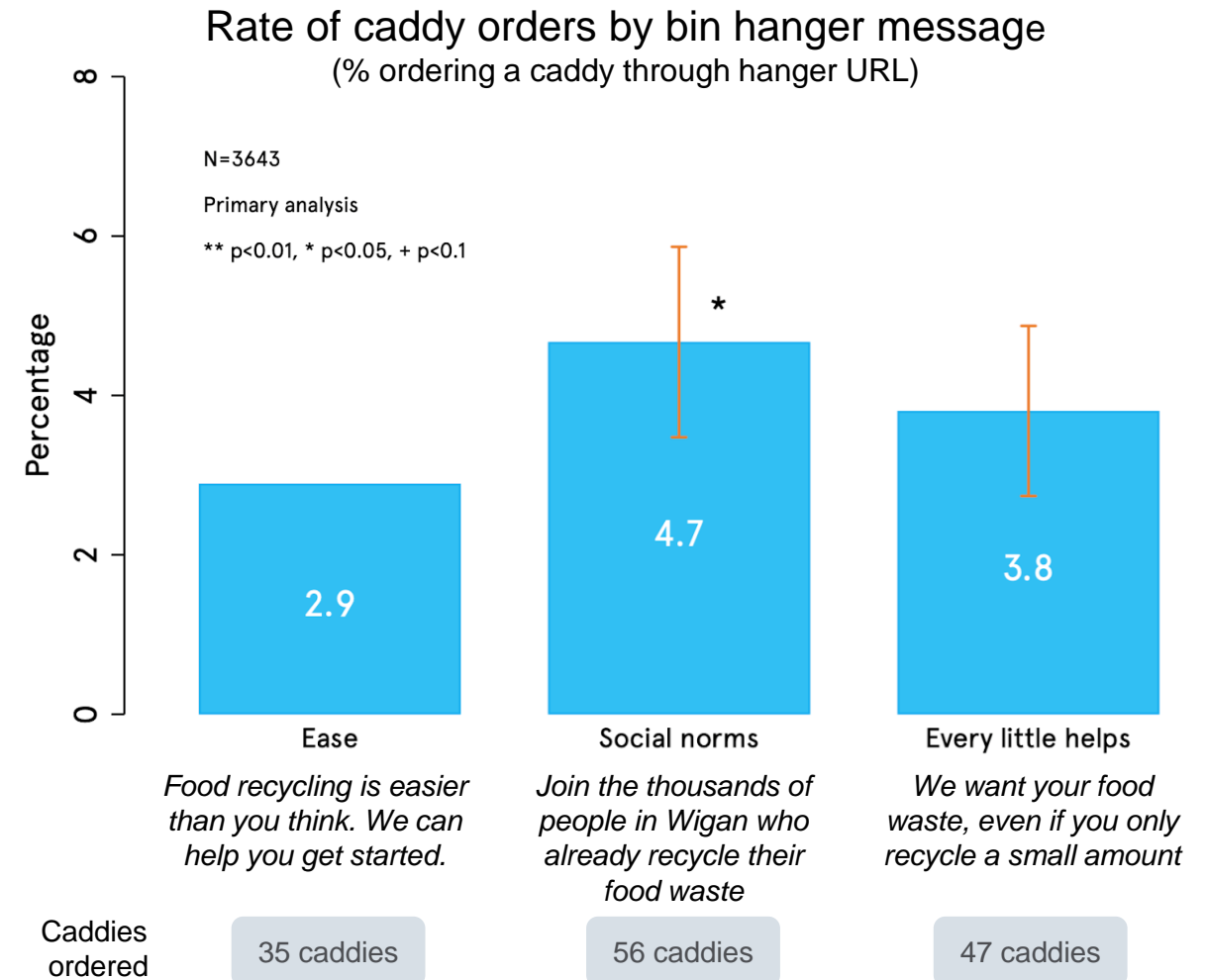
Learn more about why food recycling is important [here](#)

TIP: Set a reminder in your phone to put out your Green Bin on [collection day](#) every fortnight



Trial 3: Which hanger message was most effective?

- Every household received a hanger and we **compared the hanger messages to each other** to see which was most effective.
- We found that the **Social Norms** messaging **was more effective than Ease** at getting people to order a caddy.
- There was **no statistically significant difference between Every Little Helps and the other messages** (which means the rate difference could be due to chance).





Conclusions & Next Steps

Conclusions

- Bin tagging had a significant impact on the rate of caddy orders.
- The Social Norms message was more effective than the Ease message at getting people to order a caddy.
- While bin tagging did not have a statistically significant impact on the overall tonnage of food waste recycled, we believe the intervention is promising given the trend over time.

Next steps

We see several potential ways to build on these findings:

- **Confirm.** Re-analyse data from the same rounds again next year to see if the potential increase in food waste recycling persists.
- **Repeat.** Repeat the intervention using Social Norms messaging for other poor performing rounds.
- **Refine.** Repeat the intervention but test if it is possible to improve on the Social Norms messaging (e.g. by using more specific social norms).
- **Adapt.** Trial a bin reminder service to test if this improves recycling rates.

Annex A: Analysis methods





Implementation challenges and details

- While our project went largely to plan, we faced a few implementation challenges and made a few pragmatic decisions which readers should be aware of when considering our results.
 1. We wanted to tag every household in each round, but could only tag black bins which had been put out on the day that tags were distributed. There were 4,107 households on our two selected rounds and we placed tags on 3,643 bins (89% of eligible households).
 2. For logistical reasons, it was not possible to only send out the new behaviourally-informed materials (leaflets and stickers) to people who ordered a kitchen caddy as part of the trial. Any household who ordered a caddy during the trial period received these materials, even if they weren't on a target round.
 3. During the trial period, there was more green bin waste than expected (both more waste and more green bins being put out). This meant that, on some days, an additional truck was deployed to collect bins which crews could not reach. This affected the composition of rounds. We asked Wigan Council for a log of which rounds had been affected by these changes, and we have excluded these affected rounds from our analysis.
 4. To identify the number of caddys ordered on rounds that were not part of the trial, we collected information on all caddy orders from MyAccount. We then had to match these with a list of which households are on which rounds.



Trials 1 & 2 used differences-in-difference analysis & a synthetic control

Differences-in-difference (DID)

DiD is an evaluation method that measures the effect of some change (an 'intervention'), by looking at trends over time where the change happened (the 'treatment') and where it did not (the 'control'). In a DiD analysis, we match the trend over time of the treatment group (in this case, the targeted rounds) with another group that has a similar trend over time (in this case, the synthetic control). By matching them before we make any change, we are able to estimate the counterfactual of our intervention (what would have happened if we had not done anything) by comparing the trend line of the intervention and treatment rounds after the intervention.

Synthetic control

In a standard DiD approach, you would identify a round with a similar historical trend for your outcome variable (i.e. green bin waste or caddy orders). However, in this project, the wide variation between rounds made it extremely difficult to identify one particular round that had a parallel trend in green bin waste to the treatment rounds prior to the intervention.

We used a 'synthetic control' to address this challenge. This means we constructed an artificial (or 'synthetic') control using the weighted averages of several non-treated rounds. This 'synthetic control' could be optimized so it had a prior trend which closely matched the prior trend in our two target rounds.



Trial 1 Analytical Strategy

We estimated the following ordinary least squares (OLS) specification for our outcome measure, presenting findings at the average predicted levels of our control variables:

$$D_{it} = \alpha + \beta_1 T_i + \beta_2 T_i * P_t + \beta_3 P_t + \beta t + u_{it}$$

Our outcome analysis used the statistical software Stata. All measures were analysed using an OLS model, regressing our outcome on a treatment indicator with fixed round and time effects.

Where

D_{it} is our primary outcome measure. This is a continuous measure of green waste weight for round i , in week t .

α is a constant term, which can be interpreted as the average level of the outcome measure among the omitted category.

T_i is our treatment indicator, equalling 1 if the round i , is receiving the intervention, 0 otherwise.

$T_i * t$ is the interaction between the time trend and the treatment. This will be our coefficient of interest.

P_t is a binary indicator of post-intervention, 1 if after period 7, 0 if before.

t is our linear time trend.

u_{it} is the error term. S.Es are corrected for heteroskedasticity using Huber-white procedures.



Trial 2 Analytical Strategy

We estimated the same OLS specification for Trial 2 as for Trial 1, again presenting findings at the average predicted levels of our control variables:

$$D_{it} = \alpha + \beta_1 T_i + \beta_2 T_i * P_t + \beta_3 P_t + \beta t + u_{it}$$

We used the statistical software Stata for Trial 2 as well. All measures were analysed using an OLS model, regressing our outcome on a treatment indicator with fixed round and time effects.

Where

D_{it} is our secondary outcome measure. This is a continuous measure of the number of caddys ordered in round i , in week t

α is a constant term, which can be interpreted as the average level of the outcome measure among the omitted category.

T_i is our treatment indicator, equalling 1 if the round i , is receiving the intervention, 0 otherwise.

$T_i * t$ is the interaction between the time trend and the treatment. This will be our coefficient of interest.

P_t is a binary indicator of post-intervention, 1 if after period 7, 0 if before.

t is our linear time trend.

u_{it} is the error term. S.Es are corrected for heteroskedasticity using Huber-white procedures.



Necessary assumptions and simplifications

There were a few imperfections in the data that had to be addressed to conduct our analysis:

- For **Trial 1**, there were 14 treatment observations (2 treatment rounds with 7 post-treatment observations each) and 584 control observations.
- For **Trial 2**, there were 8 treatment observations (2 treatment rounds with 4 post-treatment observations each) and 216 control observations.
- Because we conducted a synthetic control analysis, we needed to ensure that we had a balanced dataset in which all included control and treatment rounds have the same number of collection points, meaning that:
 - For Trial 1, we had to drop the 14th (and final) collection point within some rounds;
 - For Trial 2, we had to drop rounds with 6 or fewer collection points.



Trial 3 was designed as a randomised control trial

Randomised controlled trial (RCT)

This trial was designed as a three-armed RCT. An RCT is a way to measure the impact of an intervention by randomising who gets which treatment. In this trial, this means that we randomly allocated households to one of the three messages.

Randomisation occurred at the individual level. However, as we were not able to allocate specific households to specific tags (it is often unclear which household a bin belongs to), the staff doing the tagging were given a shuffled 'deck' of tags so that households received tags with different messages randomly.

To measure which treatment a household received, each of the three tags contained a specific URL. Each URL led to a different online order form so we could track how many orders occurred through each link.

Analysis

As there was no no-action 'control' (all households received one of the three tags), we made a pairwise comparison between each treatment group (i.e. we compared the social norms message against ease, then against every little helps, then compared ease against every little helps). We could then determine if any of the messages was relatively more effective than the others.

Appendix 2: References





References

1 All statistics from this slide are from:

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2 Nomura, H., John, P. C., & Cotterill, S. (2011). The use of feedback to enhance environmental outcomes: A randomised controlled trial of a food waste scheme. *Local Environment*, 16(7), 637-653.

Schultz, P. W. (1999). Changing behavior with normative feedback interventions: A field experiment on curbside recycling. *Basic and applied social psychology*, 21(1), 25-36.

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