United States Environmental Protection Agency

CURBSIDE DISPOSAL EDUCATION CAMPAIGN PILOT: CASE STUDY

MAY 2022
EPA-842-R-22-004

TABLE OF CONTENTS

Executive Summary 3
Acknowledgements 4
Introduction and Project Scope 5
Methodology of Data Collection 12
Project Results 20
- Survey Data Analysis 20
- District 311 Request Analysis 28
- Further Data Collection Context 34
- Focus Group Takeaways 40
- Limitations 44

Replicability and Recommendations 46
- Recommendations 46
- Project Checklist 48
- Cost Estimation 49

Citations 51
Appendix 53
- Appendix A. Sticker Distribution Materials 53
- Appendix B. Data Collection Route and Sticker Distribution Maps 55
- Appendix C. Additional Images Taken During Data Collection 58
- Appendix D. Initial Data Analysis 59

EXECUTIVE SUMMARY

The Curbside Disposal Education Campaign Pilot took place from July 2020 to May 2021 and was rolled out in Washington, D.C., through a partnership between the EPA's Trash Free Waters Program and the local District government, including the D.C. Mayor's Office of the Clean City, D.C. Department of Public Works, and D.C. Department of Energy and Environment. The primary goal of this initiative was to educate residents about proper waste containment and encourage behavioral changes to reduce unintentional leakage associated with curbside municipal trash collection.

A total of 8,000 DPW-serviced, single-family homes in four target neighborhoods were selected to receive a campaign sticker, which was accompanied by material explaining the purpose of the campaign and how to apply the sticker to their municipal trash cans for a point-of-contact reminder about best practices. Average litter scores were measured by project partners on a weekly basis for 22 weeks along 1-mile representative routes in each of the four neighborhoods. To assess impact measurement, litter scoring was conducted for the 11 weeks leading up to sticker distribution and the 11 weeks following distribution. Project partners also used these representative routes to collect weekly data on compliance with the four specific recommendations outlined on the stickers. For comparison purposes, the above data collection took place along control blocks within each of the target neighborhoods consisting of households that did not receive a campaign sticker. After sticker distribution in the treatment area, the total number of stickers applied to cans along routes was also counted. **An analysis suggests that although the improvements tended to be small to moderate, this educational program had an overall positive impact on the target communities. In particular, there was a statistically significant reduction overflowing cans and overflowing and open cans combined across all neighborhoods**.

The intention of this study is to provide important findings and recommendations to inform successful adaptation and adoption of the Curbside Disposal Education Campaign Pilot approach in other interested communities.

ACKNOWLEDGEMENTS

We would like to give a special thanks to the below individuals, all of whom played a critical role in the successful planning and implementation of the Curbside Disposal Education Pilot.

Washington, D.C. Government
Julie Lawson, Director, D.C. Mayor's Office of the Clean City
Lorena Kowalewski, Associate Director, D.C. Mayor's Office of the Clean City
Matthew Robinson, Environmental Protection Specialist, D.C. Department of Energy and Environment
Katherine Antos, Senior Policy Advisor, D.C. Department of Energy and Environment
Annie White, Office of Waste Diversion Manager, D.C. Department of Public Works
Tim Harwood, Senior Data Visualization Analyst, Office of the Chief Technology Officer
Michael Bentivegna, Data Team Program Manager, Office of the Chief Technology Officer
Tomash Bukowiecki, Data Scientist, Office of the Chief Technology Officer

National Environmental Education Foundation (NEEF)
Nick Bradford, Program Director or Research & Innovation
Sara Espinoza, Vice President of Programs
Amy Skalmusky, Vice President of Marketing & Communications

Industrial Economics (IEc)
Greg Englehart, Associate
Eric Ruder, Principal

Others
Randy Hartmann, Senior Director of Affiliate Operations, Keep America Beautiful
Katie Register, Executive Director, Clean Virginia Waterways of Longwood University

This project was funded by the U.S. EPA's Trash Free Waters Program.
For any questions, please contact Layne Marshall at Marshall.Layne@epa.gov.

INTRODUCTION AND PROJECT SCOPE

Some research suggests that trash spillage resulting from lax residential curbside disposal practices is potentially a significant contributor to pollution of our waterways. EPA's Trash Free Waters (TFW) program was interested in exploring how this issue might be addressed through a low-cost public education campaign with a municipality as a potential pilot for other municipalities to learn from. The TFW program approached the Washington, D.C. Mayor's Office of the Clean City (MOCC), the Department of Public Works (DPW), and the Department of Energy and Environment (DOEE) about a potential campaign. District employees indicated that unintentional spillage was indeed an issue, and therefore agreed to partner on this campaign.

Several common trash disposal practices can increase leakage of household trash and recyclables into the environment due to factors such as animals eating holes in trash bags and wind blowing trash out of cans. These factors include:

a) Residents not closing trash can lids;
b) Residents not bagging the trash they put in trash cans;
c) Residents setting trash cans outside too far in advance of collection times and therefore increasing exposure time to factors that may cause spillage;
d) Residents using trash cans with no lids or that are otherwise damaged.

The TFW program and District Government decided to address these behaviors through a public education campaign.

Sticker Design and Messaging

The TFW program and District government partners started working with the National Environmental Education Foundation (NEEF) to brainstorm campaign messaging, format, and design that Washington, D.C. (and eventually other municipalities) could implement without exorbitant cost and staffing needs. The group determined that an eye-catching and informative sticker placed on curbside trash can lids would serve as the best method of message delivery. The sticker served as a point-of-contact reminder about proper set-out behaviors that could be easily referred to. The stickers were 12.5 inches x 4.625 inches and were designed to fit on the lid of District-provided trash cans (both small cans for semi-weekly pickup and larger cans for weekly pickup).

The campaign sticker (see Figure 1) articulated four simple actions to reduce unintentional trash spillage associated with curbside disposal:

1) Keep your lid closed, and don't overflow the can.
2) Bag your trash before putting it in the can.
3) Put trash outside shortly before pickup.
4) Request repairs or replacements by calling 311.

Figure 1. The Curbside Disposal Education Pilot Project campaign sticker design, distributed to 8,000 District households.

The chosen behavioral messages were developed in accordance with Community-Based Social Marketing principles that have a proven record of effectiveness. For example, behaviors were framed positively rather than negatively (e.g., "Put trash outside shortly before pickup" rather than "Don't put your trash outside too early"). These behaviors were identified through both research and first-hand eye-witness accounts by District Government employees as to what they perceived as the most important problem behaviors to address.

The behavioral messages were written in plain language to be as direct and straightforward as possible. The logo of each District Government partner was included so recipients of the sticker could know this material was coming from credible local government sources in partnership with EPA's TFW program.

In addition to the behavioral messages, the slogan "Cleaner communities and waterways start here" (with an arrow pointing to a picture of a trash can) was chosen to connect clean, healthy neighborhoods and nearby waterways and appeal to local pride and a sense of community. Finally, ancillary information (including the parenthetical about refraining from bagging recyclables and directing recipients to District webpages and #TrashFreeDC for more information) was added.

The sticker purposefully used a similar font and color palette to existing District campaigns around waste management and littering that had brand recognition with residents (Trash Free DC, Zero Waste DC, and Not in My DC) to increase the credibility of the messages and identification with other trash-related campaigns.

Sticker Logistics and Distribution

Eight thousand stickers were disseminated to Department of Public Works-serviced single-family homes in four pre-selected neighborhoods: Brightwood, Park View, Rosedale/Kingman Park, and Trinidad (See Figure 2). Each of these high-density neighborhoods received roughly 2,000 stickers. See Appendix B for more detailed maps denoting the estimated boundaries of sticker distribution in the four target neighborhoods.

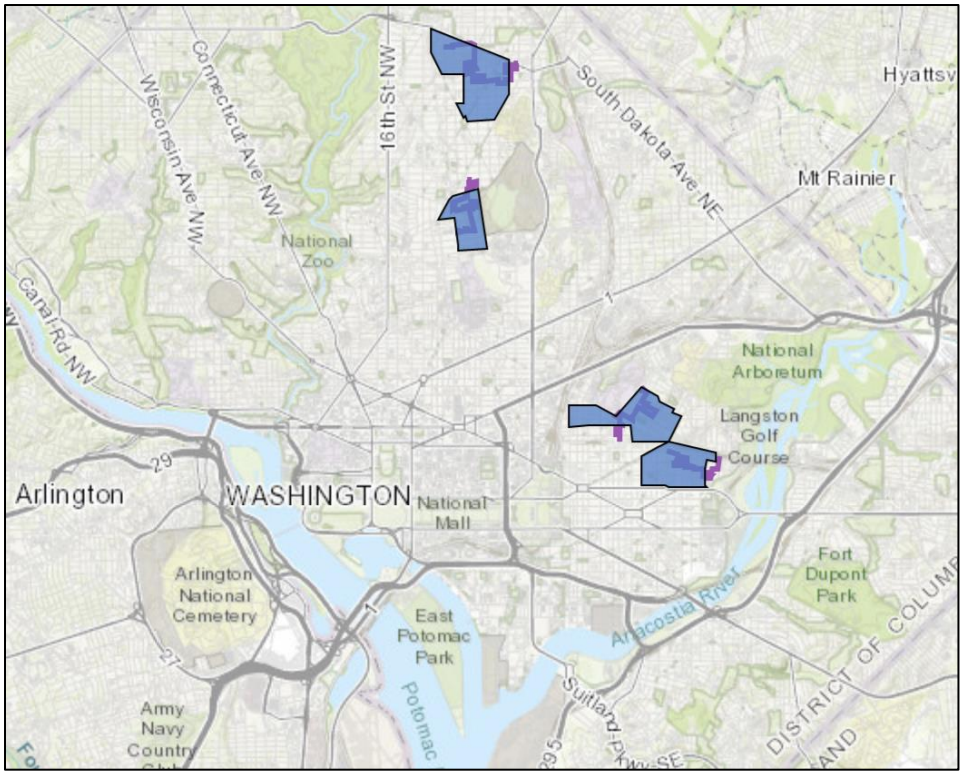


Figure 2. Map showcasing estimated sticker distribution areas in the pilot's four target neighborhoods.

The four target neighborhoods were selected based on the three criteria below:

1. Pre-existing waste management issues.
2. Prevalence of high-density single-family homes (District government partners were not interested in targeting residents of apartment buildings or businesses. Larger detached homes took up too much geographical spread to make data collection efficient).
3. Representative population size (to aid with expansion and/or replicability in other communities).

Staff and coronavirus-related limitations prevented District staff and campaign volunteers from having direct conversations with residents regarding the campaign goals and ensuring that all stickers were actually applied to residents' trash can lids. Because direct verbal interaction was not feasible, the stickers were placed into eye-catching cardstock presentation cards. These presentation cards identified the problem of trash in the environment associated with curbside disposal behaviors. The cards also encouraged residents to apply the sticker to their trash can lids as a reminder of best practices (see Figure 3). A simple set of directions was added to the back of the sticker to reduce confusion about specific placement on trash can lids (See Figure 4).

Hello, Neighbor!

We know you want to keep your community and local waterways clean, and this free sticker can help. Please place it on your green trash can lid as a reminder about how to properly dispose of trash.

Mayor Bowser's Office of the Clean City has partnered with the U.S. Environmental Protection Agency's Trash Free Waters Program to reduce the amount of trash falling onto our neighborhood streets and sidewalks. Trash that spills on streets and sidewalks attracts rats and other pests. It can also be carried by water or wind into our sewers and ultimately wind up in local rivers and streams. The attached sticker lists a few simple steps you can take to help keep your local community and waterways free from trash.

To read more about how you can help keep your community clean, please visit the Mayor's Office of the Clean City at cleancity.dc.gov or zerowaste.dc.gov, and follow #TrashFreeDC on social media.

CLEAN CITY DC

DEPARTMENT OF ENERGY & ENVIRONMENT

GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

Figure 3. Presentation card with slots to hold the educational sticker in place.

Figure 4. Graphic on the back of the sticker with directions on how to properly apply the sticker on a can.

District Government staff), Advisory Neighborhood Commissioners (ANC) and community volunteers (i.e., Adopt-A-Block groups) all pitched in to help distribute the 8,000 stickers to residents in the select neighborhoods. Volunteers were given a project overview and walk sheets (map of routes/addresses) and directed to deliver the materials to residents in the select neighborhoods by leaving the presentation card and sticker between the porch door and front door or in the door jam of each home. This process took a little over one week.

Additional Campaign Messaging

In addition to the 8,000 stickers directly distributed to households in the four targeted neighborhoods, project partners also disseminated campaign messaging via social media and a District Government landing page. Through this approach, District residents who did not receive the campaign sticker were provided an opportunity to learn about best curbside disposal practices.

An array of District Government social media accounts – the Mayor's Office of the Clean City, D.C. Department of Public Works, D.C. Department of Energy and Environment, and Zero Waste D.C. – helped spread the recommended disposal behaviors via Twitter and Facebook. Below are some example posts.

Figure 5. Examples of social media posts shared by District Government accounts during the campaign.

The D.C. Mayor's Office website featured a short overview of the pilot project along with a more comprehensive description of the four recommended disposal behaviors for District residents. The webpage also encouraged citizens who did not receive a sticker to contact District staff about printing and distributing stickers for their neighborhoods' trash cans. The website can be viewed at: https://communityaffairs.dc.gov/page/cleaner-communities-and-waterways.

METHODOLOGY OF DATA COLLECTION

The most critical element of a pilot project is testing the campaign's effectiveness and then determining what modifications need to be made before expanding it to a larger population or a different community. To measure the success of the Curbside Disposal Education Pilot, two MOCC staff members collected data on a weekly basis along 1-mile representative routes in each target neighborhood (Brightwood, Park View, Rosedale/Kingman Park, and Trinidad).

These 1-mile representative walk routes were determined by selecting areas with a high prevalence of single-family homes and service alleyways. Staff optimized effort by avoiding streets with large apartment complexes and commercial spaces and instead emphasizing how many alleyways could be walked within the short distance. Approximately 1,022 households along the four representative data collection routes made up the "treatment group" and received a sticker. Control blocks were determined within each of the four target neighborhoods and consisted of approximately 285 homes that would not receive a sticker. Control blocks were typically at the start or end of each representative data collection route to ensure simple separation during data analysis. See Appendix B for more detailed maps denoting the 1-mile data collection routes in each of the four target neighborhoods, as well as maps showcasing the overlap between data collection route and treatment group.

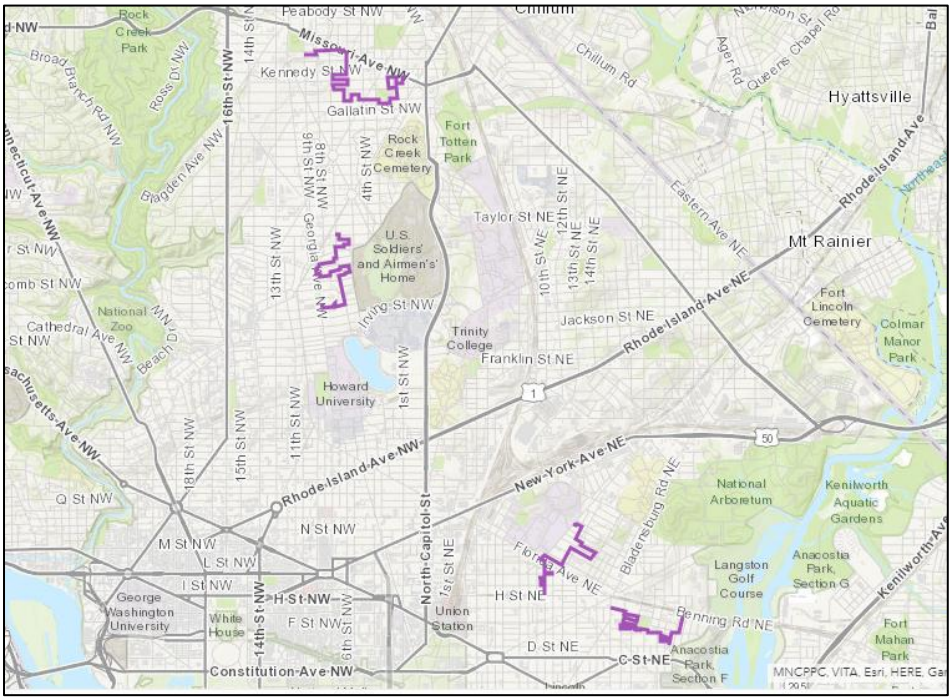


Figure 6. Map of the weekly 1-mile data collection routes in the pilot's four target neighborhoods. More detailed maps of each neighborhood can be found in Appendix B.

Generally, from August 17 to November 13, 2020, MOCC staff members walked each of these four routes once a week to observe trash spillage prior to the launch of the sticker campaign. From November 16, 2020, to February 5, 2021, the MOCC staff walked the designated routes to collect data after the stickers were disseminated. The Brightwood and Park View neighborhoods routes were walked the day before trash collection, and the Rosedale/Kingman and Trinidad neighborhood routes were walked the day after trash collection. It is important to note that several holidays impacted the DPW service schedule during the data collection period, meaning residential curbside pickup would "slide" to a day or two later than usual. To limit the holiday variables, District staff shifted their routine walk to ensure that the time between data collection and trash pickup was consistent with the typical schedule. Another variable the holiday schedule adjustments may have introduced is related to the size of the trash cans. Some of the neighborhoods had a semiweekly pickup, and therefore, they had smaller trash cans. Homes on a weekly pickup schedule typically had "super cans," which allow for a greater volume of trash. It is likely that holiday slides impacted households with a semiweekly pickup schedule more than homes serviced on a weekly basis because the smaller can volume could translate to more overflow.

For each block along the four 1-mile representative routes, data were collected based on six indicators:

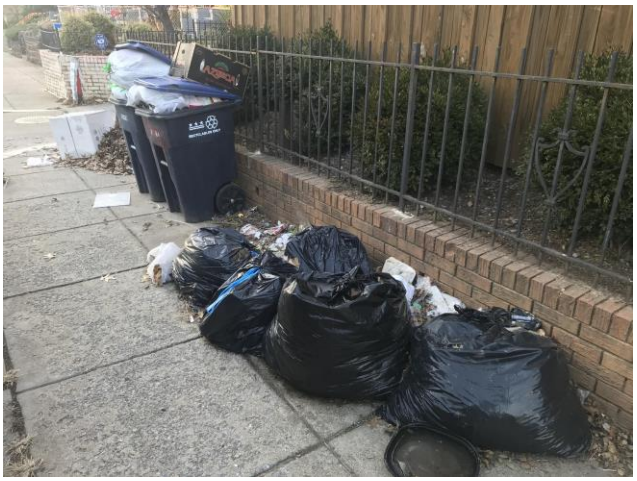
1) Litter index score
2) Total number of cans
3) Number of overflowing cans
4) Number of open cans
5) Number of cans with a campaign sticker applied to the lid
6) Additional information such as photographs or notes of significant issues

These data indicators are explained in more detail in the following section.

Data Indicator 1: Litter Index Score

Assessing the level of litter, on a scale of 1 to 4, along 1-mile representative routes in each neighborhood.

To determine if the campaign stickers and educational material led to a reduction of alleyway litter, MOCC staff members conducted observational litter surveys for eleven weeks prior to sticker distribution and conducted another eleven weeks of litter surveys after the stickers were distributed.



Litter levels were determined using a rapid visual assessment protocol similar to the Visual On-Land Trash Assessment for Stormwater. Alleyways and street fronts were evaluated on a 1 to 4 scale, with 1 meaning there was practically no spillage on the street, and an individual could pick up any litter under 5 minutes, and 4 meaning there was a great deal of litter on the street which would require professionals to clean up. Any overflow trash placed on the ground outside of a can because it could not fit inside was incorporated into the litter index score. Examples of different alley conditions and their respective assigned litter levels are depicted below.

<u>Level 1 of the Litter Index Score</u>

Effort required to clean: One person could complete under 5 minutes as a walk-by pickup effort.

Level 2 of the Litter Index Score

Effort required to clean: Two+ people could complete during a dedicated pickup effort.

Level 3 of the Litter Index Score

Effort required to clean: A concentrated community cleanup event.

Level 4 of the Litter Index Score

Effort required to clean: A team of professionals from the city would be needed to be called to efficiently clean up the debris.

Data Indicators 2-4: Counting Cans

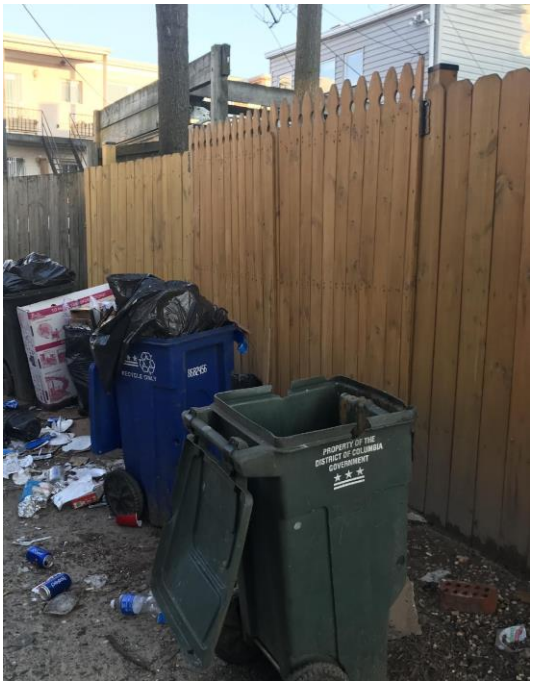
District staff collected weekly data regarding compliance with several sticker recommendations by counting the below indicators on each block.

A) Total number of cans
The total number of cans was counted on each block to determine if more residents properly stored their cans before and after collection. This indicator provided insight into the sticker recommendation “Place trash in can outside shortly before pickup.”

B) Number of overflowing cans
A can was quantified as “overflowing” when trash was “piled up like an ice cream cone” so high it was impossible to shut the lid properly. This indicator provided insight into the sticker recommendation, “Keep your lid closed and don’t overflow the can.”

C) Number of open cans

A can was quantified as “open” when the can could be closed securely with the lid down but was not. This indicator provided insight into the sticker recommendation “Keep your lid closed and don’t overflow the can.”



Data Indicator 5: Number of cans with a campaign sticker applied to the lid

Assessing the prevalence of campaign stickers.

For the eleven weeks following the distribution of the stickers and educational material, the number of observable trash can campaign stickers was counted weekly. This metric was later used to calculate the percentage of cans with stickers.

Data Indicator 6: Additional Information

Sharing supplementary details and photo evidence.

District staff also made note of any significant issues like illegal dumping/ bulk, construction debris, or the presence of rodents. Photos were taken intermittently throughout each route to provide further insight on alleyway conditions.

Project partners were unable to collect and analyze data related to one of the four sticker recommendations: “Bag your trash before putting it in your can.” While legality was not a concern because the District owns the cans provided to D.C. DPW-serviced homes, this assessment would be extremely time consuming and make the data collection team more noticeable to residents (which could influence resident behaviors and impact campaign results). Therefore, District staff could not collect data to provide insight into the campaign’s effect on this specific behavior.

PROJECT RESULTS

Survey Data Analysis

An analysis was conducted to measure the impacts of the Curbside Disposal Education Pilot Project on curbside trash spillage. As explained in the preceding section, data were collected in the four target neighborhoods for eleven weeks prior to distribution of the campaign stickers and educational material. Then data were collected for another eleven weeks following campaign material distribution. Metrics included in the survey data analysis are as follows:

1) Litter index score
2) Total number of cans
3) Number of overflowing cans
4) Number of open cans
5) Number of cans with a campaign sticker applied to the lid.

For each of the four neighborhoods, the weekly collected data points for the five metrics listed above were compiled from August 17 to November 13, 2020. Then again from November 16, 2020, to February 5, 2021, to provide a comparison before and after the stickers and educational material were distributed. Of course, Metric 5 data were only collected after the stickers were distributed.

Metrics 1, 3, and 4: Assessing Litter Levels and Unsecured Cans

The first part of the analysis, below, looks specifically at Metrics 1, 3, and 4. Metrics 3 and 4 – overflowing and open cans – were collected individually but combined during analysis to provide a broad overview of the issues of unsecured trash can lids.

Project partners compared the neighborhoods that received stickers (i.e., treatment group) to those that did not receive stickers (i.e., control group) to evaluate the differences in these groups before and after the treatment inflection point of November 2020 – when stickers were distributed. Since there were existing differences between the groups in the pre-treatment period, project partners used a difference-in-differences regression analysis to determine the program's effects more accurately. The difference-in-differences analysis method accounts for differences between observed groups prior to treatment and controls for these differences when determining treatment effects. For the purpose of this analysis, project partners limited these regressions only to alleys, as there were very few instances where cans were serviced along a street front. Where cans along street fronts were present, project partners found the impacts limited and generally not reflective of where stickers were placed. For each model, project partners ran two separate versions, one including location-specific fixed effects (to offset any unexplained variation across sites) and one with no such effects.

Our analysis suggests that the program had an overall positive impact, although the improvements tended to be small to moderate. Using the difference-in-differences regression analysis, project partners found improvements in 13 of the 16 measured metrics (Metric 1, Metric 3, Metric 4, and Metric 3 and 4 combined, across four neighborhoods) (See Figure 7). Five of these findings were statistically significant at the 90% confidence level (one of the five was only significant in the fixed-effects model). Project partners also found significant negative effects in the number of overflowing cans across all neighborhoods and the combined number of overflowing and open cans. Simplified regression results are available below in terms of magnitude of change, direction of change, and whether the change was statistically significant or not (Figure 7). A table of all findings related to this sub-analysis, including those not statistically significant, can be found in Appendix D.

Neighborhood	Metric	Magnitude	Direction	Significant
Brightwood	Litter Index Score	-0.395	↓	Yes
Brightwood	Open Cans	-1.286	↓	Yes
Brightwood	Overflowing + Open Cans	-1.640	↓	Yes
Park View	Overflowing Cans	-2.616	↓	Yes*
Park View	Overflowing + Open Cans	-3.769	↓	Yes
Combined (All Neighborhoods)	Overflowing Cans	-1.364	↓	Yes
Combined (All Neighborhoods)	Overflowing + Open Cans	-2.159	↓	Yes

Figure 7. Table of statistically significant findings from difference-in-differences regression analysis for average litter index score and number of overflowing and/or open cans observed during data collection before and after treatment. (=Only statistically significant in the fixed effects model).*

Metrics 2 and 5: Total Number of Cans and Cans with Campaign Sticker

Project partners also used a difference-in-differences regression analysis like the above on Metrics 2 and 5 to assess the program's effects on the number of cans and the number of cans observed with the campaign sticker applied along each neighborhood's data collection route. There was no statistically significant change in the total number of cans counted – a metric used to provide insight on if the campaign successfully encouraged residents to properly stored their cans before and after collection (i.e., placed/returned the cans from the curbside promptly). A total of 109 maximum stickers

were counted by project partners along the representative neighborhood routes. The maximum number of stickers counted for each block in any given week was compiled to account for variability (i.e., it was likely that data collection walk-by timing did not universally coincide with can placement out on the curb, so the maximum number of stickers observed serves as an indicator of campaign reach rate).

Neighborhood	Can Total			Number of Households		Maximum # of Stickers
	Magnitude	Direction	Significant	Treatment	Control	
Brightwood	0.0596	↑	No	338	28	29
Park View	1.0264	↑	No	212	85	30
Rosedale Kingman	-1.429**	↓	No	218	102	26
Trinidad	-7.487	↓	No	254	70	24
Combined (All Neighborhoods)	**-3.536**	↓	**No**	**1,022**	**285**	**109**

Figure 8. Table of findings from difference-in-differences regression analysis showing the number of cans observed, number of households along the data collection route, and the maximum number of stickers observed on cans. (=Only statistically significant in the fixed-effects model; **Direction of sign changes in fixed-effects model).*

Key Findings

a) Overall, there were improvements in 13 of the 16 neighborhood metrics (Metric 1, Metric 3, Metric 4, and Metric 3 and 4 combined, across four neighborhoods) as well as across all four metrics at the combined project level (See Figure 7).
    a. There was no statistically significant change found in the amount of litter prevalent before and after stickers were distributed along the representative data collection routes in the four target neighborhoods combined. However, a statistically significant decrease in the average litter index score was found in the Brightwood neighborhood.
    b. There were statistically significant improvements across all neighborhoods at the combined level regarding both the number of overflowing cans as well as the total number of overflowing and open cans combined.
    c. Although not statistically significant, the number of cans decreased in both Rosedale-Kingman and Trinidad neighborhoods, indicating the sticker messaging could have led some people to put cans away more quickly after collection (See Figure 8).

d. None of the three "negative" effects (i.e., increased/worsening litter scores or increased number of overflowing or open cans) were found to be statistically significant (See Appendix D).

b) The maximum number of stickers observed by District staff along the four representative data collection routes was 109 in total (See Figure 8). Because approximately 1,022 households in the treatment group along the four representative routes combined, project partners can infer around 10.6% of households that received the campaign materials applied the sticker to their trash cans. However, this number is likely higher, as greater compliance with sticker recommendations would also mean cans spent less time out in alleyways and street fronts where data collection occurred, and stickers could be counted.

Discussion

Metrics 1, 3, and 4

Results of the analysis show seven statistically significant findings in the improved direction (i.e., a lower litter index score or fewer overflowing cans), meaning the campaign had an overall positive effect on the treatment group. This can be compared to no statistically significant findings in the “wrong” direction (i.e., higher litter index score or more overflowing cans). Of the remaining non-significant results, the majority were in the improved direction.

A potential contributing factor of finding no statistically significant change in the amount of litter prevalent before and after stickers were distributed along the representative data collection routes in the four target neighborhoods combined could relate to the timing of data collection (See Appendix D and Figure 9). Brightwood and Park View neighborhood routes were observed prior to trash pickup, while Rosedale Kingman and Trinidad were observed after. This may explain the differences in the levels of improvement that could be observed between these neighborhoods. For example, the finding of no litter index score improvements in the Rosedale Kingman and Trinidad neighborhoods may be attributed to the fact that data were collected following trash collection, and therefore the alleyways looked less littered because D.C. DPW crews removed excess trash. The small number of control group households in Park View and Trinidad may have also limited the ability to detect statistically significant effects in those neighborhoods and at the combined level.

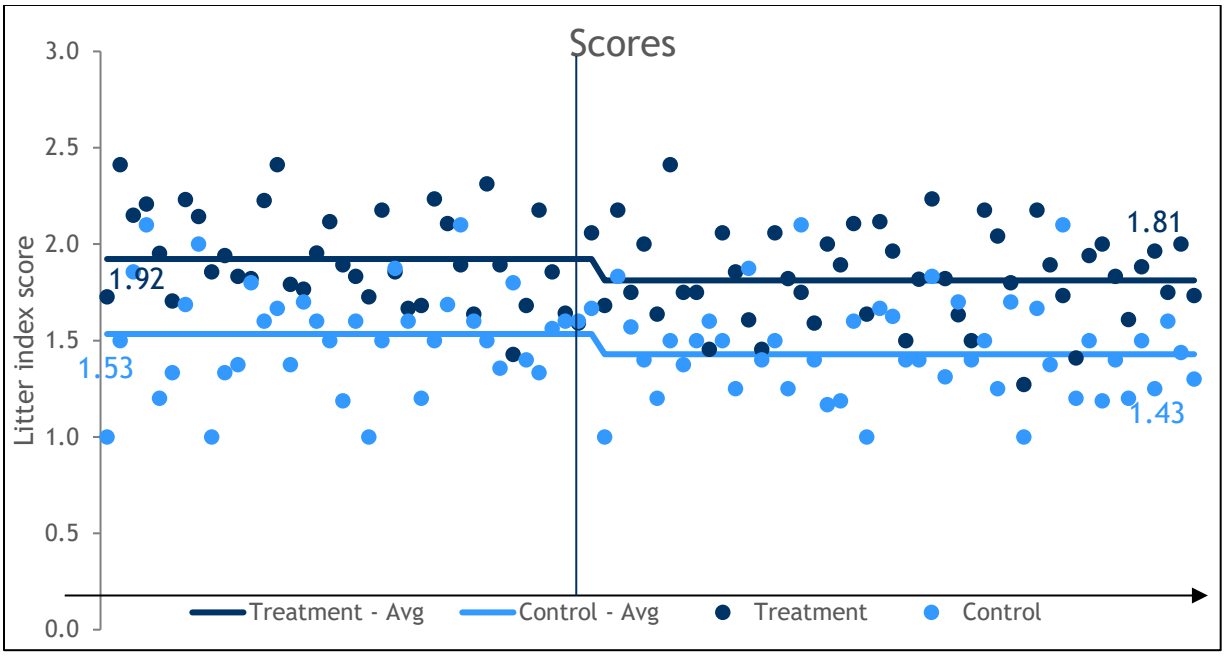


Figure 9. Graph showing the average litter index score across all four neighborhoods over time. The blue vertical line signifies sticker distribution.

Despite the above, there was a statistically significant decrease in the average litter index score for Brightwood – which decreased by an order of magnitude of approximately 0.4 comparing before and after treatment time periods (See Figure 10).

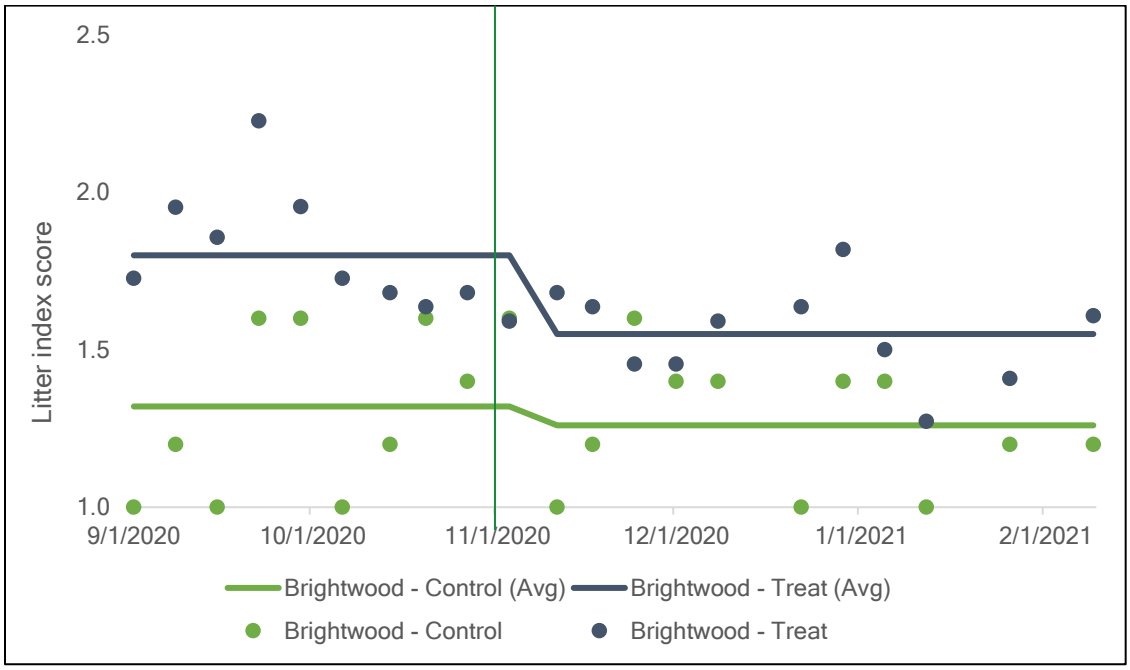


Figure 10. The average litter index score for Brightwood decreased by an order of magnitude of ~0.4 when comparing pre- and post-treatment time periods. Sticker distribution timing is denoted by the blue vertical line.

In addition, all four neighborhoods showed statistically significant improvements in the number of overflowing cans (See Figure 11) and the number of overflowing and open cans combined (See Figure 12). For example, in the Park View neighborhood, the difference-in-differences regression suggests that blocks that received stickers experienced a statistically significant reduction in the total combined number of open and overflowing cans of ~3.77 cans. Prior to the treatment period (receiving a sticker), those same blocks were reported as having an average of ~9.73 open and overflowing cans each week. Since the campaign sticker recommended “Keep your lid closed and do not overfill your can,” the decrease in overflowing cans suggests that residents shifted their behavior after being informed by the educational campaign.

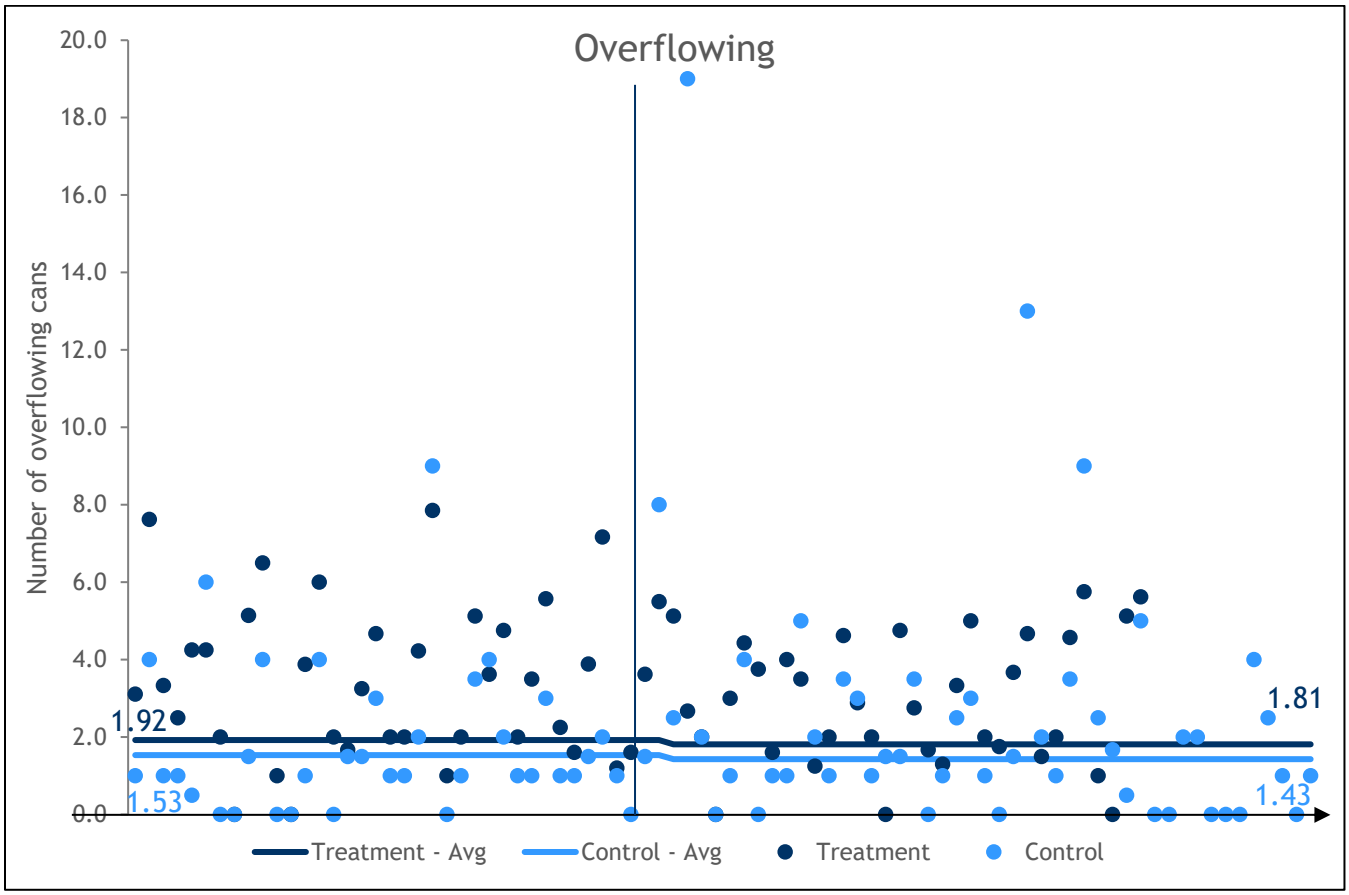


Figure 11. The number of overflowing cans across all four neighborhoods combined decreased by an order of magnitude of -1.364 when comparing pre- and post-treatment time periods.

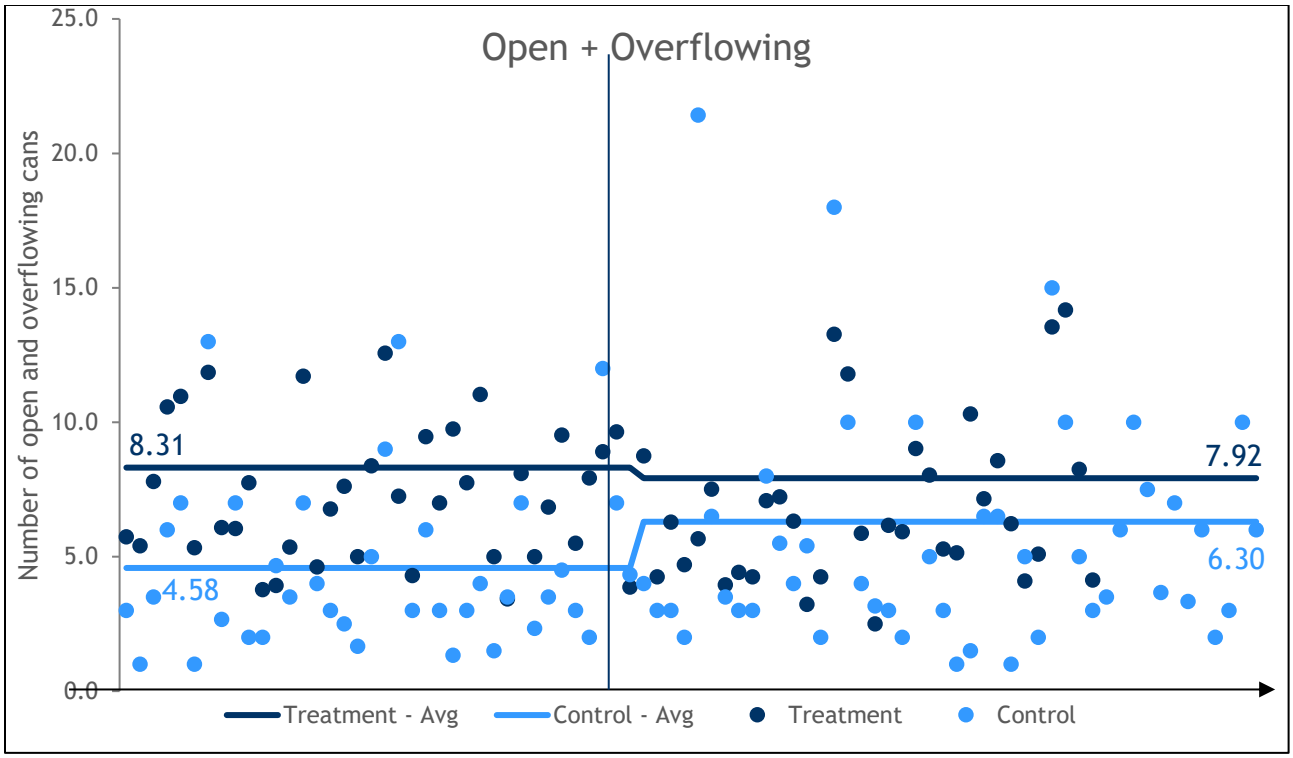


Figure 12. The number of open and overflowing cans across all four neighborhoods combined decreased by an order of magnitude of -2.159 when comparing pre- and post-treatment time periods.

While District staff did not observe a statistically significant decrease in the amount of litter surrounding the cans (categorized in the litter index score), project partners can assume that less litter escapes into the environment if more cans are closed and secure.

Cans with closed lids are presumed to be less vulnerable to spillage (i.e., waste is more likely to blow out of open cans and open cans provide easier access to pests and other animals). The lack of significant change in the amount of litter surrounding cans can likely be attributed to weekly data collection timing and/or the relatively stable weather experienced during the period of data collection.

Metrics 2 and 5

Although not statistically significant, the number of cans decreased in both Rosedale-Kingman and Trinidad neighborhoods. This could indicate the sticker messaging led some people to put cans away more quickly after collection, as recommended via the inclusion of “Place trash in can outside shortly before pickup” on the sticker.

Since it was too difficult to determine whether all cans with stickers were placed out on any given day of data collection, project partners determined the maximum number of

stickers as an indicator of the campaign “contact” rate by summing the maximum number of stickers counted for each block in any given week. For example, the maximum number of stickers counted at 200 Jefferson St. Alley was seven on February 9th. The maximum number counted at 1200 Owen Pl. Alley was six on both December 18th and January 8th. This method likely undercounts the total number of stickers to a small extent since it is likely that in some neighborhoods, there was never a week where all cans with stickers were placed on the curb at the time of data collection. In addition, it is important to note that refraining from applying the sticker does not mean a household threw away the educational material before reading it. In some cases, the sticker and ancillary messaging were still read by recipients, which may have exhibited certain positive behavior changes.

The number of homes included in the treatment group and control group in each neighborhood was quantified after data collection was completed using online software to show a more accurate representation of the treatment effect. The number of properties along each alley varied greatly – for example, in Brightwood, the number of households along the data collection walk route varied from 28 to 65 properties per block ID. When comparing the number of stickers applied versus the total sample size, project partners found that calculating the total number of households along each data collection route was more representative than solely counting the number of cans present because many residents own and put out several cans, but each household only received one sticker.

Despite the relatively small sticker application rate of 10.6%, project partners still managed to find positive impacts of the campaign and believe the initial results are promising. Compared to other District government canvassing efforts (e.g., regular email distributions and door-to-door canvassing for senior Covid-19 testing), this campaign was relatively successful in terms of reach rate. For example, suppose 10.6% of the homes in the treatment area showcased the campaign sticker on their can, and data collection routes accounted for approximately 12.7% of households that received the campaign materials. In that case, it can be inferred that more than 1,000 trash cans in the four target neighborhoods chose to display the sticker.

In addition, D.C. DPW services about 105,000 homes, while the Curbside Disposal Education Campaign Pilot’s treatment group size was only around 1,022 homes. If sticker distribution increased to even a fifth of D.C. DPW-serviced households, it could translate to an impressive impact on the city and could drive even more statistically significant results. District staff have expressed interest in potentially expanding the campaign to be District-wide.

District 311 Request Analysis

As previously mentioned, 311 is a telephone and online portal wherein District residents may contact District employees to address issues such as trash can repair and replacement, alley cleaning, etc. (See the left-hand column of Figure 15 for a more extensive list of 311 request options). The intention of this part of the analysis is to determine if more 311 requests were submitted in the target neighborhoods after sticker distribution, as prompted by recommendation #4 on the sticker: “Call 311 or visit 311.gc.gov for assistance with cans needing repair or replacement.”

District staff compiled a dashboard of 311 service requests submitted during the treatment period, from November 2020 to February 2021, after stickers were distributed. The 311 service requests were categorized by Single Member District (SMD), or subdivisions of District wards/neighborhoods represented by different Advisory Neighborhood Commissioners, and the requests from SMDs that approximately overlay the boundaries of the four target neighborhoods were pulled out for this analysis. To compare service requests submitted during the previous year, the District average for 311 service requests was subtracted to isolate the effect of the campaign.

After controlling for annual trends and seasonality, project partners found the effect of the education program across the four target neighborhoods increased by 2.2 percentage points (See Figure 13). The seasonal impact was controlled by comparing the average rate of change in the number of requests from month to month during the treatment period of November 2020 through February 2021. The annual trend was accounted for by taking the difference in the rate of change from the previous year for the same months (November 2019 through February 2020).

Year	District	Target Neighborhoods	District y/y	Target Neighborhoods y/y	Difference of Target Neighborhoods - District
2020- 2021	-7.8	-6	-4.6	-2.4	**2.2**
2019- 2020	-3.2	-3.6	6.5	5.3	**-1.2**

Figure 13. Degree of change in 311 requests when controlling for annual trends and seasonality.

The highest potential degree of change in the number of 311 requests was found in the Trinidad neighborhood (+5.3), while the lowest was found in Park View (-1.7) (See Figure 14).

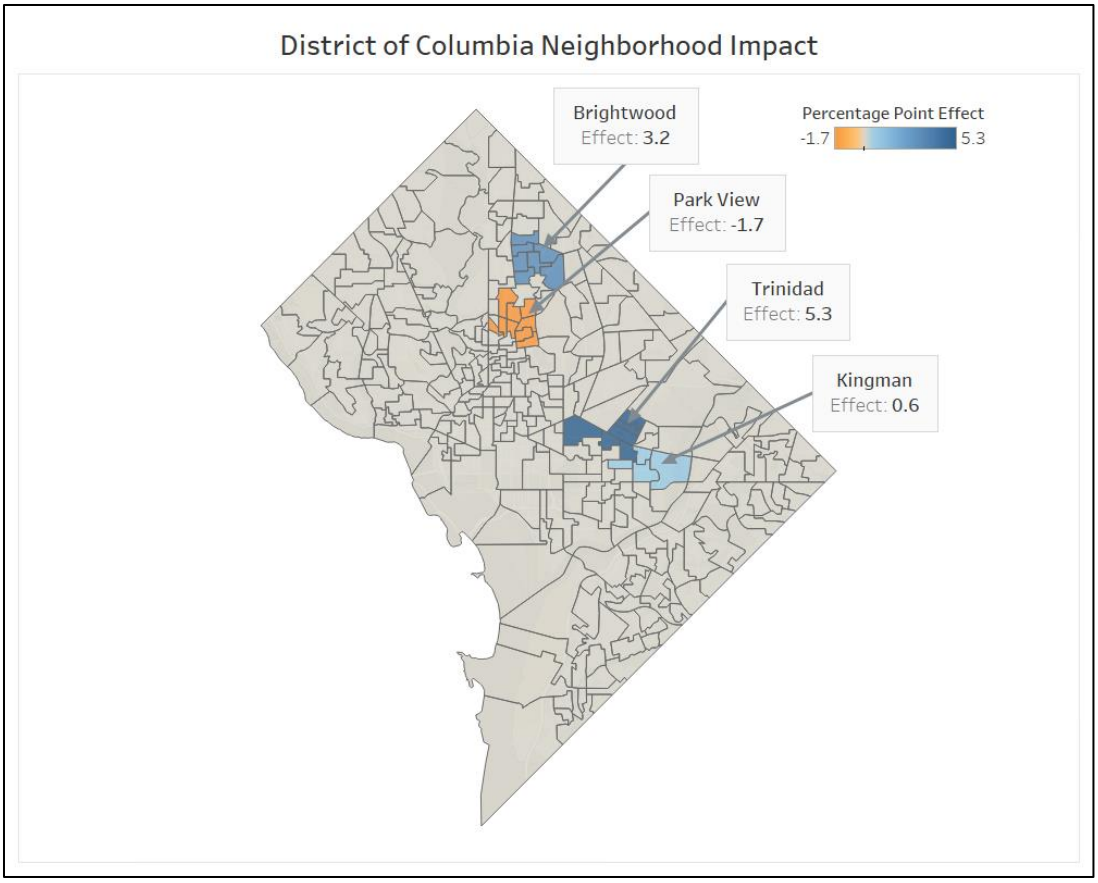


Figure 14. Map visualizing the degree of change in 311 requests according to each target neighborhood.

For the purposes of this analysis, project partners incorporated a broader group of 311 service request data than explicitly mentioned on the sticker. The campaign sticker encouraged residents to use 311 for help with can repair or replacement specifically, but several additional types of service requests were included in the analysis because of District staff interest in their correlation with the overall campaign message/goal of cleaner communities, such as alley cleaning and rodent inspection and treatment (See Figure 15). As depicted in the table below, more service requests were submitted in the priority neighborhoods compared to the District average in several categories: alley cleaning, bulk collection, recycling cart repair, rodent inspection and treatment, sanitation enforcement, and supercan delivery.

Service Request	Brightwood	Rosedale Kingman	Park View	Trinidad	**Across Service Totals**	Average Number of Requests Per Month
Alley Cleaning	13.9	-7.1	-18.0	-0.4	**3.1**	60-82
Bulk Collection	-4.2	-5.9	3.1	6.2	**0.9**	608-744
Rat Replacement Containers	98.4	56.8	-51.1	31.2	**-1.4**	1-10
Recycling Cart - Repair	-51.1	-5.2	51.7	32.3	**14.9**	6-8
Recycling Cart Delivery	-32.4	-8.3	-55.9	-22.6	**-24.3**	30-46
Rodent Inspection and Treatment	14.5	9.7	3.4	11.3	**8.2**	120-152
Sanitation Enforcement	22.9	37.2	-3.3	11.2	**9.2**	59-104
Supercan - Delivery	11.8	146.5	-24.8	-18.1	**5.5**	33-38
Supercan - Repair	53.2	4.0	6.5	160.3	**-5.6**	5-16
Trash Cart - Delivery	-17.1	-24.1	-33.0	7.4	**-13.1**	37-51
Trash Cart Repair	18.4	48.9	-66.9	-61.5	**-29.6**	6-14
Within Neighborhood Totals	**3.2**	**0.6**	**-1.7**	**5.3**	**2.2**	
Average Number of Requests Per Month	236-308	176-208	294-361	317-360		

Figure 15. This table shows the percentage point change in service requests for the 4 target neighborhoods relative to the District average, while comparing the treatment period of November 2020-February 2021 to November 2019-February 2020.

The graph below shows the key takeaways of 311 requests from November 2020 through February 2021 in the four target neighborhoods (See Figure 16). The drastic increase in the bulk collection could be related to the Coronavirus pandemic, as many residents worked from home and took this time to clean out their property. While repair

of cans was higher in these neighborhoods compared to the District average (2.4), delivery of new cans was lower (-8.5). Few people were moving to Washington, D.C. during the beginning of the Coronavirus pandemic, which could contribute to a smaller number of can delivery requests in specific neighborhoods. In addition, a nationwide shortage of supercans due to supply chain issues during the pandemic affected the number of new cans available for delivery.

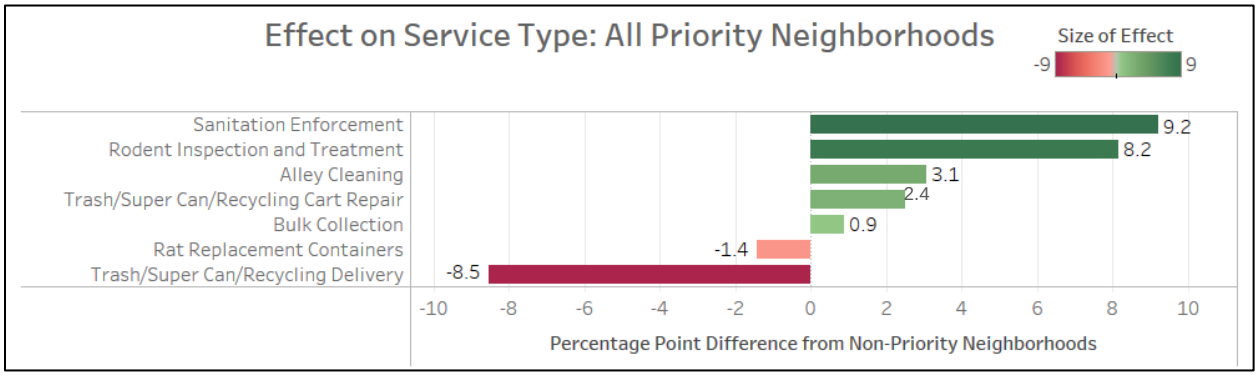


Figure 16. Degree of change in 311 requests compared to District average. For the purposes of this visualization, several complementary service requests were combined into one line item, such as repair of trash carts, super cans, and recycling carts.

As shown in the graph below, a surprising amount of certain 311 requests were submitted on behalf of residents in the four target neighborhoods compared to the District (See Figure 17). For example, 38% of District-wide rodent inspection and treatment requests submitted from November 2020-February 2021 were made in these neighborhoods.

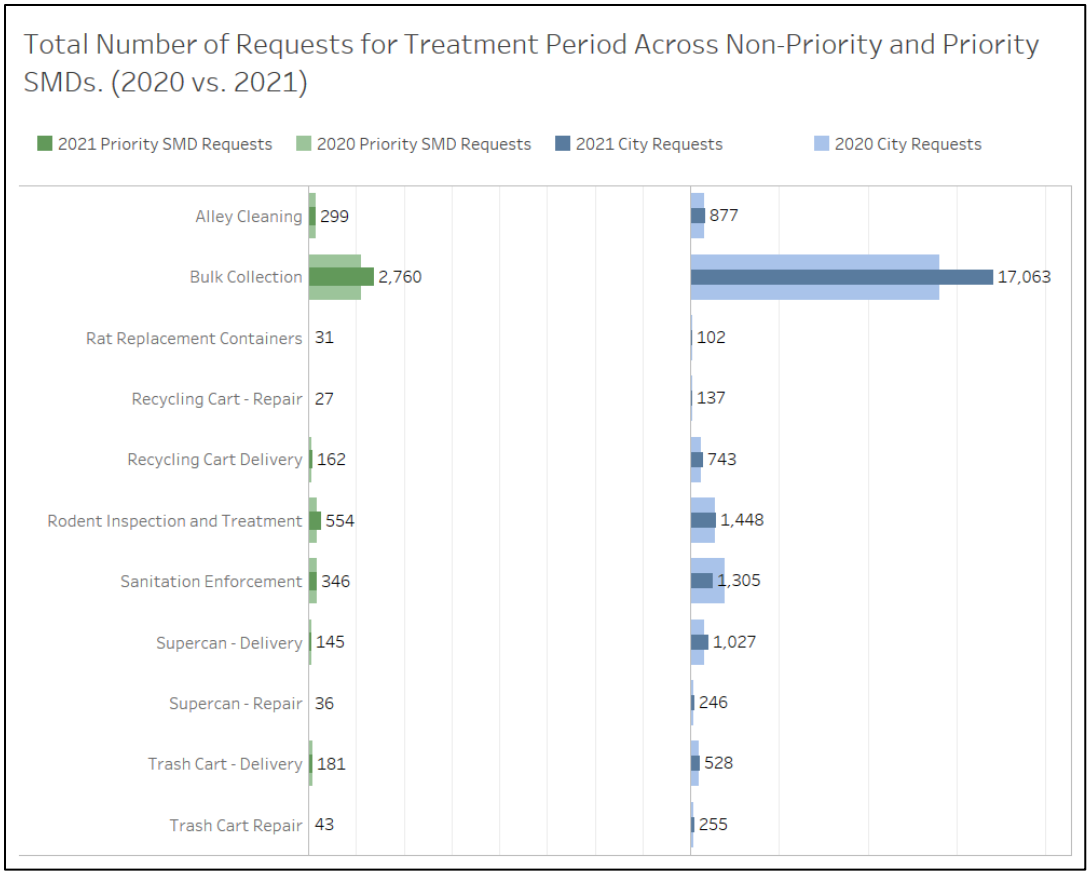


Figure 17. District 311 request submissions for Single Member Districts (SMDs) overlaying the four target neighborhoods compared to the rest of the District, comparing November 2019-February 2020 ("2020," control period) and November 2020-February 2021 ("2021," treatment period).

District Sanitation Enforcement Analysis

Sanitation enforcement was the most impacted service type in the priority neighborhoods with a +9.2 degree of change after treatment compared to the District average according to the 311 service request data analysis detailed above (See Figure 16). District residents can request sanitation enforcement and report improper disposal of trash or solid waste. In response, District Solid Waste Education and Enforcement Program (SWEEP) inspectors issue ticket violations, including leaving trash/recycling containers in a public space (alleyways and street fronts) before 6:30 pm the day before collection or after 8 pm on collection day. This behavior was specifically outlined on the campaign sticker, which encouraged residents to "place trash in can outside shortly before pickup." An increase in the number of sanitation enforcement requests in these neighborhoods could mean that after being informed by the campaign sticker, residents were able to take action and promote better behaviors from their neighbors. It is also possible that newly appointed Advisory Neighborhood Commissioners (ANC) were eager to report mismanaged trash because the pilot's treatment period coincided with ANC elections.

After identifying this finding, District staff compiled additional data specific to sanitation enforcement in the wards, including the four priority neighborhoods. The below analysis outlines the number of sanitation enforcement tickets distributed in the four wards, which incorporate the smaller target neighborhoods between November 2020 and February 2021, and compares that to the same four-month period in the previous year. These data were only available on a ward-level basis and did not completely represent the specific block IDs included in the treatment groups that received the stickers. Two sanitation enforcement ticket types were included in this analysis: a) R110 - Solid Waste not properly stored/contained for collection and providing food or breeding ground for rodents or causing a potential fire hazard; and b) R220 - Solid Waste Containers out for collection at wrong time or place.

The average number of sanitation enforcement tickets per year (January-December) per ward dropped from ~50 tickets in 2019 to ~19 in 2020. This is likely attributed to reduced District capacity during the Coronavirus pandemic, which may also be seen in the sanitation enforcement row comparison of 2020 and 2021 in Figure 17 above. Findings show that although there were fewer citations year to year District-wide as well as specifically from November 2020-February 2021 in the wards that encompass the four priority neighborhoods compared to the same four-month period a year prior, the tickets that were distributed after treatment were more often made in the priority neighborhoods compared to the rest of the District. In fact, 69 tickets were distributed in the four wards in the four months following sticker distribution (November 2020-February 2021), totaling $2,700.

Further Data Collection Context

District staff observed changes over the 22-week data collection period that may or may not be as evident in the data analysis described in the prior section. The below is intended to provide further context, experiential insight, and additional findings from on-the-ground data collection.

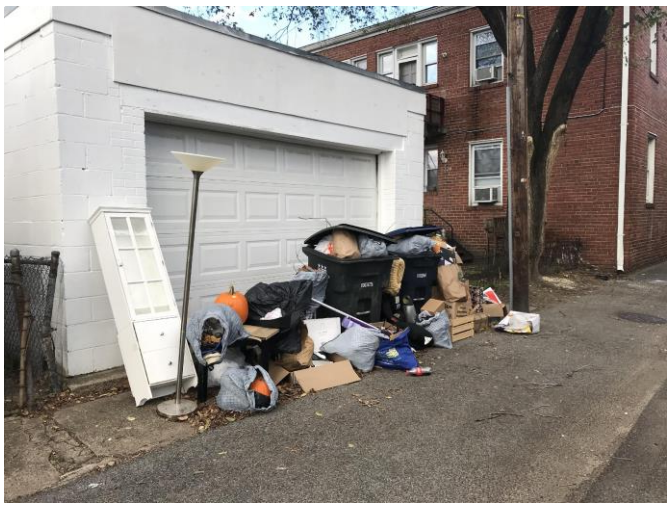
District staff reported that impressionistically, they noticed an impact in the overall cleanliness of alleyways and street fronts along the 1-mile representative routes in each target neighborhood before and after stickers were distributed.

After sticker distribution, dozens of examples of homes with cans exhibited the campaign sticker and seemed to show proper disposal behaviors. In one neighborhood, a District staff member noticed that one household put the sticker on their can right away (this was noted the week after distribution), but no other stickers were counted on the street. The following week, the neighbors on each side of the “early adopter” had applied their stickers. As project partners had hoped, this suggests that one resident inspired by the campaign could influence others to take positive action. Project partners also recount several households along the data collection routes that suddenly started storing their cans away from the alley (outside of waste collection time) after the campaign stickers were distributed.

Unfortunately, campaign stickers were evident but improper disposal practices such as can overflow or spillage were noted. In addition, several recycling carts were spotted with the sticker applied to the lid despite explicit directions provided on the back of the sticker instructing recipients to place it on a trash can, not a recycling cart. To avoid confusion, the sticker showcased a green can graphic, and the accompanying campaign materials deliberately referenced a “green trash can,” but this was still not enough in a few cases. Though many sticker recommendations also apply to the disposal of recyclable material, the campaign was intended to focus on residential trash.

District staff discovered that dumping of bulk debris, mainly associated with home cleaning/moveout/foreclosure, was a significant problem in the four target neighborhoods. Discarded furniture such as mattresses and sofas often piled up in alleyways and, in some instances, remained for several weeks without collection. For example, one Brightwood alleyway improved significantly in litter levels after one household, a repeat offender, completed the move-out process.

In Washington, D.C., curbside bulk collection is permitted when a resident specifically requests it through 311 because trash crews cannot accommodate for large items on their weekly pickup routes. The images below of bulk debris in front of a garage were taken one week apart and show early signs of spillage and the inability of trash crews to service the cans because of their placement behind a pile of miscellaneous items. The third image shows mattresses leaning upon a fence, which was noted on the data collection sheet as being present for four consecutive weeks.



Debris associated with construction was also prevalent along the data collection routes and had an indirect impact on alleyway litter scoring,

The data collection team observed that instances of bulk debris/ illegal dumping or excessive spillage from curbside cans were often caused by the same households week after week. In some cases, the impact of these “repeat offenders” on the surrounding neighborhood was evident because their mismanaged waste spread throughout the alleyway over time. This is another example of how baseline measurement of litter index levels and disposal behaviors could help inform more targeted outreach and education. The impacts of “repeat offenders” on the behaviors of neighbors were not specifically addressed in this study, but research suggests that litter attracts more litter, meaning people are more likely to litter in areas they already perceive as unclean, further exacerbating the problem.

There was repeated dumping in a particular alleyway along the Brightwood data collection route, which did actually display a District government-provided “No Dumping” sign. In a different alley, the dumping of hazardous materials like oil and paint was noted and serviced by DPW soon after being reported.

Evidence of rodents, either through visible bite marks and holes in can lids or actual rat carcasses, was also well cited in data collection notes.

A potential solution to reduce the amount of unintentional litter associated with residential pickup is to encourage using a designated waste can storage area near the back of each home for use outside of collection day. District staff observed that homes with space set aside for store cans often exhibited better disposal behaviors and were kept tidy and clean, likely because the area was perceived as part of an individual's property. This can be compared to homes that were engineered in a way that almost required permanent placement of bins in communal areas like an alleyway, for which an individual may feel less responsible. The District government may explore the validity of this potential solution further.

Focus Group Takeaways

Methodology

After distribution, project partners hosted several focus groups to garner community feedback on the campaign sticker. Typically, focus groups are held after initial campaign messaging, and sticker design have been developed before any orders have been placed. This ensures that feedback can be incorporated into the final product. However, due to the timing of contractor support and Covid-19, this effort was pushed to March 2021, after the campaign materials were shared with residents in the four target neighborhoods.

The project team conducted two focus groups to gauge resident feedback on the educational material and their experiences with the District Government and their communities. The first focus group included Advisory Neighborhood Commissioners (ANC) from Single Member Districts within the treatment area. The second focus group was held with residents recruited from solid waste-related service requests made through the 311 system between November to December 2020, also residing within the treatment area. District staff used a random number generator to pull 60 names from this list. Eight individuals from the list volunteered to participate in a meeting.

Each focus group ran for 60 minutes and covered the following topics: neighborhood characteristics, alley characteristics, opinions and understanding of trash and recycling, comments on the educational material, and opinions of and engagement with overall government services and local waterways. The below discussion outlines key takeaways within the project's scope. The focus groups were recorded for notetaking purposes.

Key Findings

Participants in both groups indicated a high engagement level with their neighborhoods and District government operations, unsurprisingly given the recruitment methods.

Perceptions of Alleys

Participants have mixed feelings about the alleys they live on, exacerbated (both positively and negatively) by their experiences during the Covid-19 public health emergency. They described often gathering in their alleyways with their neighbors to socialize and letting children play. Still, the presence of illegal dumping, rodents, and human waste gave them reservations about using the space more often:

> Commissioner: "My 10-year-old likes to ride his bike back there, but I worry about disease—I make him take a shower."

> Resident: “I let my son ride his scooter back there, which I question sometimes. It’s a nice usable space; it would be great if it was a little bit cleaner.”

The insight shared by the participants suggests that alley design impacts alley cleanliness, among other factors. Very narrow alleys correlate with more neighbor conflict and a sense of disorder, while alleys that have recently been improved through programs such as “AlleyPalooza” (the District Government’s alley repair and rehabilitation program) become cleaner and more attractive after the upgrade. It was also suggested that alleys with a mix of single-family rowhouses and apartment buildings tended to have more overflowing dumpsters and uncollected bulk trash at the multi-family properties (these residences are serviced by private haulers instead of the D.C. DPW). Multiple participants commented on spillage and damage to cans and property from D.C. DPW’s collection vehicles.

Understanding of District Disposal Guidelines and Services

All participants correctly knew their trash and recycling collection days, which was unsurprising given the focus group recruitment method. Most reported splitting the duties of taking the trash from the house to the can, and the can to the collection point, with a household member (spouse or child). This takeaway solidifies the importance of simple and easy to understand sticker verbiage and the use of illustrations to convey key campaign messages. Despite the District sanitation requirement that cans may only be in public space for collection after 6:30 pm the night before collection and until 8 pm on the collection day, most participants reported that it was common practice on their block to leave cans in the alley at all times. This suggests that in order for more lasting behavior change around can placement, and enhanced enforcement may be necessary.

Commissioners reported using the District’s 311 system for overflowing trash and sanitation enforcement. Operationally, they use 311 to create a paper trail to demonstrate ongoing/repeat problems because they find servicing agencies “treat everything like an isolated event.” Residents say they use 311 and follow agency social media accounts to stay up to date on District policies and programs. This suggests that a city-wide service system used to submit and manage requests is a valuable investment for municipalities, as well as distributing pertinent information via social media and agency newsletters, as demonstrated in this comment:

> Commissioner: “Reporting dumping and overflowing cans through 311 on Twitter has worked wonders.”

Perspectives on the Campaign Sticker

Participants in both groups expressed confusion about the purpose of the sticker, indicating that they already knew all the tips and wondering if the garbage can was the right location to place these messages:

> Commissioner: “If I brought my bin in, the rats would be in my backyard. Not sure how keeping bins in my property solves the rat issue.”

Focus group participants were likely to be more knowledgeable about proper disposal behaviors than residents as a whole because of the focus group recruitment method used; however, it is likely that many residents were not familiar with all four recommendations included on the sticker. However, future focus group efforts should consist of participants with no known prior engagement with waste-related issues in their city to provide a more representative treatment sample group. Holding focus groups before sticker design and messaging have been finalized can help reduce future confusion around the educational product’s intention and expected outcomes. Some of this confusion could have also been alleviated if project partners were able to hold one-on-one conversations during the distribution process or if they were able to implement a more comprehensive educational campaign.

A few participants suggested making the recommendations shorter and removing ancillary information so the product could be smaller:

> Commissioner: “I wonder if the programs would allow us to eventually remove all of the logos and other information from the stickers themselves (but still keep them on the flyer explaining the program, of course). I wonder if we could make the stickers rounder, cuter, and easier for folks to like enough that they'll slap it on their cans.”

Several would have preferred a similar product but focused on recycling instead, particularly related to rinsing items and keeping them loose in the bin:

> Commissioner: “The info we get through the mail is very helpful. I didn’t see how these stickers added to it. I know some people who don’t recycle. The sticker isn’t going to move them.”

Participants also broadly believed that if an individual was motivated enough to apply the campaign sticker on their trash can, they were likely already following the behaviors outlined on the sticker. In addition, participants felt that the people who most need this education are the least likely to change behavior. This doubt around the ability to effect change in the “worst offenders” is shared among many in the behavior change

community, no matter the cause (i.e., environmental, health-related, etc.). However, strategic steps outlined in Community-Based Social Marketing can be taken to most effectively reach these groups. A potential next step could be to use a similar approach to identify repeat offenders and inform more targeted messaging to influence behavior of those select individuals:

> Resident: “I think it would be helpful to my neighbors, but I don’t think they would follow it. Are they not aware, or do they not care? Maybe it will help a few.”
>
> Commissioner: “The only people who put the sticker on already bring their bin in. If you don’t bring your bin in, why would you put a sticker on there saying you should?”

The above findings and comments can help inform improvements to a similar approach to residential curbside disposal education in other communities.

Limitations

As outlined in the Data Collection Methodology and Statistical Analysis sections above, several nuances may have influenced the findings (i.e., timing and frequency of walk routes). The most significant potential impact on this project was the Coronavirus pandemic.

If project partners were able to interact directly with residents when distributing campaign materials, the percentage of residents who applied a sticker to their trash cans would likely have been much higher. Unfortunately, the presentation card served as the only form of communication between project partners and sticker recipients. In the few instances where District staff and volunteers encountered residents during canvassing, residents reacted positively when receiving the educational materials. One of the most effective methods of Community-Based Social Marketing is to educate trusted and influential individuals who can, in turn, help persuade others to adopt a specific behavior – this approach also likely would have increased the number of stickers applied.

For this pilot, project partners considered whether it would be best to avoid contact with residents entirely by applying the sticker to residential trash cans on their behalf. Although the cans are District-provided, project partners decided against this approach to avoid any complications associated with cans located on private property. Project partners were also unsure how effective the sticker would be in changing behaviors if it was applied without directly prompting a resident to read or absorb the recommendations.

The Coronavirus pandemic also had implications on capacity. During the beginning of the pandemic, District staff were assigned to emergency response teams and had less bandwidth for carrying out logistics for this project. The pandemic also impacted the number of volunteers to help distribute stickers to residents in the target neighborhoods.

The full extent of the impacts of Covid-19 on data collection is unknown; however, project partners assume there was more improperly disposed of bulk waste than typically found in the four target neighborhoods because Washington, D.C.'s Fort Totten transfer station – the District's dedicated bulk waste drop-off location – was closed to residents for several months. The amount of residential waste produced in each household may have increased during the pandemic because so many more individuals were working from home than in pre-pandemic times. In addition, news sources, including *The Washington Post,* reported on what they referred to as "the great decluttering of 2020," where stay-at-home orders and social distancing guidelines led to mass home cleanouts, inundating donation centers and causing temporary closures

once warehouses were deemed full. The number and type of 311 service requests could also be influenced by those at home more likely to witness mismanaged waste and submit a complaint.

REPLICABILITY AND RECOMMENDATIONS

Recommendations

In conducting this pilot project and case study, project partners have identified a number of recommendations for those interested in launching a similar campaign. The following suggestions for improvement are related to project partner selection, campaign messaging and design, effective implementation and advertisement, and thorough impact measurement. Additional research ideas for consideration are also included below. The concluding project checklist and cost estimation summary can be used to adopt and adapt a similar approach to curbside disposal behavior change in other communities.

Partner Selection

It is critical to have a key project champion to ensure the success of a similar campaign. Julie Lawson, Director of D.C. MOCC, played an essential role during the early planning stage of this pilot project and maintained this role throughout the rollout of the campaign by keeping fellow District government leadership (DPW, DOEE, and the Mayor) and the Interagency Waste Reduction Working Group informed about project progress. MOCC staff also attended monthly Advisory Neighborhood Commissioner (ANC) meetings for each neighborhood included in the project scope. At these meetings, MOCC staff explained the initiative to ensure commissioners would be able to accurately respond to any questions about the effort from citizens. MOCC staff dedicated countless hours to weekly data collection and led both focus group meetings. Having a passionate on-the-ground partner with the community's best interests at heart can make all the difference in campaign effectiveness. Any future effort should incorporate perspectives from a variety of stakeholders to ensure project success, including the solid waste industry, stormwater, local neighborhood associations, volunteer/advocacy groups, and others.

Sticker Messaging and Design

Conduct baseline data before narrowing in on a list of recommendations. Project partners developed the four recommendations included in this campaign through background research and first-hand knowledge. Yet, through observations during the campaign, it became apparent that another issue that could have been addressed in the sticker recommendations was illegal dumping and bulk debris.

Time constraints affected the ability to hold a series of focus groups with residents prior to final decision on sticker design and verbiage. Having a discussion with members of the intended target audience in advance of the campaign's rollout would have been extremely helpful to ensure that a sticker was the best form of communication and that

the proposed campaign messaging resonated with them. The perspectives and suggestions shared during a focus group will undoubtedly enhance overall campaign effectiveness.

Campaign Rollout

As mentioned above, campaign messaging is more effective when distributed in combination with brief personal contact with a trusted source. Going a step further in educating residents about proper disposal behaviors by encouraging them to act upon this information is advisable. The use of “commitments” is recommended in Community-Based Social Marketing to promote ownership and responsibility in carrying out a specific action in the future. A commitment could be a verbal agreement; for example, a resident might agree to the following request: “We are asking residents to commit to undertake proper curbside disposal behaviors to help keep our waterways and communities clean; would you be willing to join the growing number of people who have made a similar pledge and agree to apply this sticker and follow these recommendations?” Alternatively, a commitment could be physical such as signing a pledge to follow the four recommended disposal behaviors.

Advertisement & Marketing

Public signage is a must in a more broad-reaching city or county-wide education campaign. Physical signage in public spaces, social media content, press releases, news coverage, and other forms of communication can serve as a frequent reminder of the campaign recommendations even while residents are outside the home. Hosting community cleanup events or educational presentations with neighborhood groups and Advisory Neighborhood Commissioners combined with campaign messaging could increase engagement in the cause.

Impact Measurement

Below are several recommendations related to data collection methodology:

- Collect data consistently either the day before pickup or day after pickup, or collect data twice a week (keeping in mind the collection schedule for each neighborhood if it differs).
- Collect data from a larger area (increase the size of both the treatment group and control group).
- Depending on your community, focus on gathering data from alleyways, not street fronts.
- Quality control: If there are multiple individuals conducting data collection, ensure they all have the same understanding and perception of what constitutes a certain litter index score, overflowing can, etc.

- If not limited by capacity restraints, collect data throughout the sticker distribution period.
- Distribute a follow-up survey or canvass door to door to better understand the self-reported impact of the sticker on resident behavior.

Part of the data analysis would not be possible without existing municipal data tools on 311 service requests and sanitation enforcement. If your community does not already collect this information, project partners recommend it as the first step to best target efforts.

Future Considerations

Additional data analysis to conduct with more time and resources:

- Is the process of waste pickup (operator mismanagement or speed of service) a significant contributor to the amount of litter in a community?
- Are households observed with a sticker applied to their can more likely to exhibit proper disposal behaviors (i.e., is there a correlation between sticker and closed cans, or do the alleyways with more stickers have lower litter index scores)?
- Are cans more likely to be overflowing if they are small (trash cart) versus larger (supercan)? Or on a weekly or semiweekly pickup schedule?

Project Checklist

- ☐ Determine project partners
- ☐ Conduct a baseline assessment to identify key issues to target
- ☐ Draft of slogan and recommendations
- ☐ Draft of sticker design and ancillary messaging (i.e., presentation card)
- ☐ Hold focus groups for feedback on campaign messaging and design
- ☐ Develop an impact measurement plan
- ☐ Incorporate focus group feedback into the final draft of sticker
- ☐ Announce forthcoming campaign launch to the public
- ☐ Begin data collection
- ☐ Place an order for stickers
- ☐ Receive sticker order
- ☐ Distribute stickers
- ☐ Boost external campaign messaging (social media, news coverage, etc.)
- ☐ End data collection
- ☐ Host focus groups for further feedback

- ☐ Conduct data analysis
- ☐ Determine efficacy and next steps

** Remember to set aside enough time for approval from all project partners before each essential step.*

Cost Estimation

EPA partnered with the National Environmental Education Foundation (NEEF) to design and produce the stickers later distributed to target neighborhoods. The total price for the 8,000 stickers ($4,589.81) and die-cut wrappers ($1,533.77) was $6,123.48. This means individual stickers cost ~ $0.76 each. It is worth noting that these were custom size, performance grade vinyl stickers to fit the cans appropriately and withstand the elements of being outdoors. Variations could be even more affordable if future iterations used different dimensions, material, design, and if bought in greater bulk. The above budget does not include printing the supplementary presentation cards. District staff and volunteers carried out weekly data collection and the sticker distribution process.

CITATIONS

Green Solutions, 2008. “Clark County Curbside Recycling Pilot Program.” Clark County Department of Public Works. www.clark.wa.gov/recycle/documents/SWAC/ClarkCoPilotProjectFinalReport2.pdf

“How and Why People Litter.” Geelong, AUS. https://www.geelongaustralia.com.au/litter/article/item/8d0baf9822eb50d.aspx

Keep America Beautiful. “2009 National Visible Litter Survey and Litter Cost Study.” https://www.kab.org/sites/default/files/News%20%26%20Info_Research_2009_NationalVisibleLitterSurveyandCostStudy_Final.pdf

Keep America Beautiful. “2020 National Litter Study: Summary Report, May 2021.” https://kab.org/wp-content/uploads/2021/05/Litter-Study-Summary-Report-May-2021_final_05172021.pdf

Koncius, Jura. “The great decluttering of 2020: The pandemic has inspired a cleanout of American homes.” *The Washington Post.* August 5, 2020. https://www.washingtonpost.com/lifestyle/home/the-big-pandemic-clean-out-clearing-the-junk-out-of-your-home-while-stuck-there/2020/08/04/230d71d2-c868-11ea-a99f-3bbdffb1af38_story.html

Owens, E.L., Zhang, Q., and Mihelcic, J.R. 2011. “Material flow analysis applied to household solid waste and marine litter on a small island developing state.” J. Environ. Eng., 137 (10), pp. 937-944. https://ascelibrary.org/doi/abs/10.1061/(ASCE)EE.1943-7870.0000399

Spehr & Curnow. *Litterology*. 2015. Book.

Visual On-Land Trash Assessment for Stormwater. April 15, 2015. EOA, Inc. http://scvurppp.org/wp-content/uploads/2018/05/Updated_Visual_Trash_Assessment_Methodology_4_15_2015.pdf

Wagner, T.P. and Broaddus, N. 2016. “The generation and cost of litter resulting from the curbside collection of recycling.” Waste Management, (50), pp. 3-9. https://www.sciencedirect.com/science/article/pii/S0956053X16300526

Wagner, Travis P. “Analysis of the Residential Curbside Collection of Trash and Recycling and the Generation of Associated Litter in Portland, Maine.” November 2015. https://www.nrcm.org/wp-content/uploads/2015/12/PortlandMSWStudy_twagner_Nov2015.pdf

APPENDIX

Appendix A. Sticker Distribution Materials

Hello, Neighbor!

We know you want to keep your community and local waterways clean, and this free sticker can help. Please place it on your green trash can lid as a reminder about how to properly dispose of trash.

Mayor Bowser's Office of the Clean City has partnered with the U.S. Environmental Protection Agency's Trash Free Waters Program to reduce the amount of trash falling onto our neighborhood streets and sidewalks. Trash that spills on streets and sidewalks attracts rats and other pests. It can also be carried by water or wind into our sewers and ultimately wind up in local rivers and streams. The attached sticker lists a few simple steps you can take to help keep your local community and waterways free from trash.

To read more about how you can help keep your community clean, please visit the Mayor's Office of the Clean City at cleancity.dc.gov or zerowaste.dc.gov, and follow #TrashFreeDC on social media.

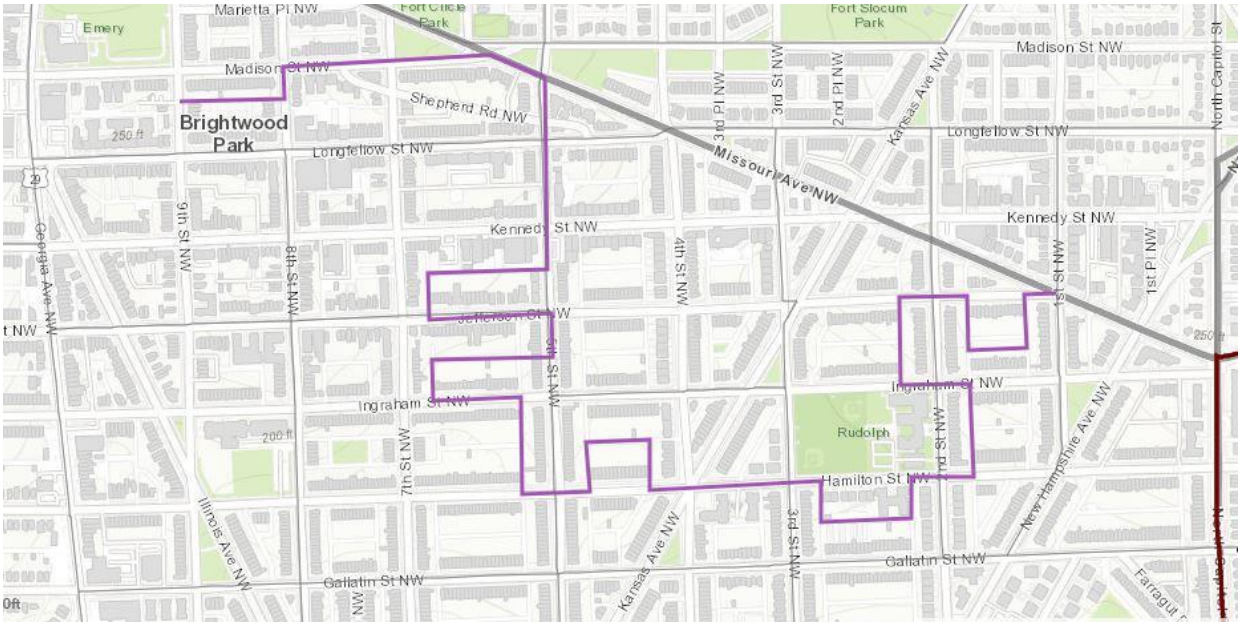
CLEAN CITY DC

DEPARTMENT OF ENERGY & ENVIRONMENT

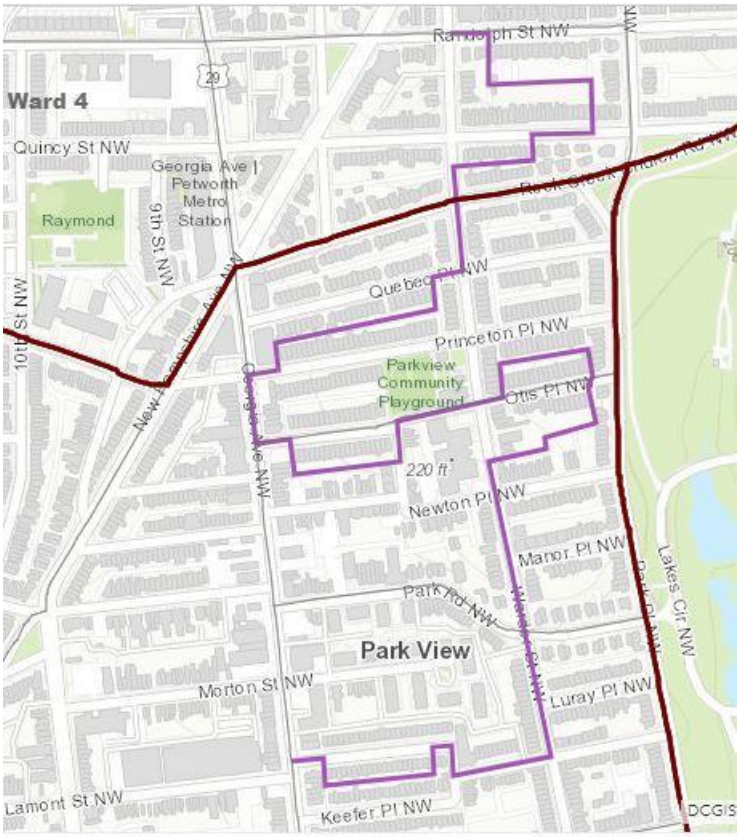
GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

Appendix B. Data Collection Route and Sticker Distribution Maps

Brightwood

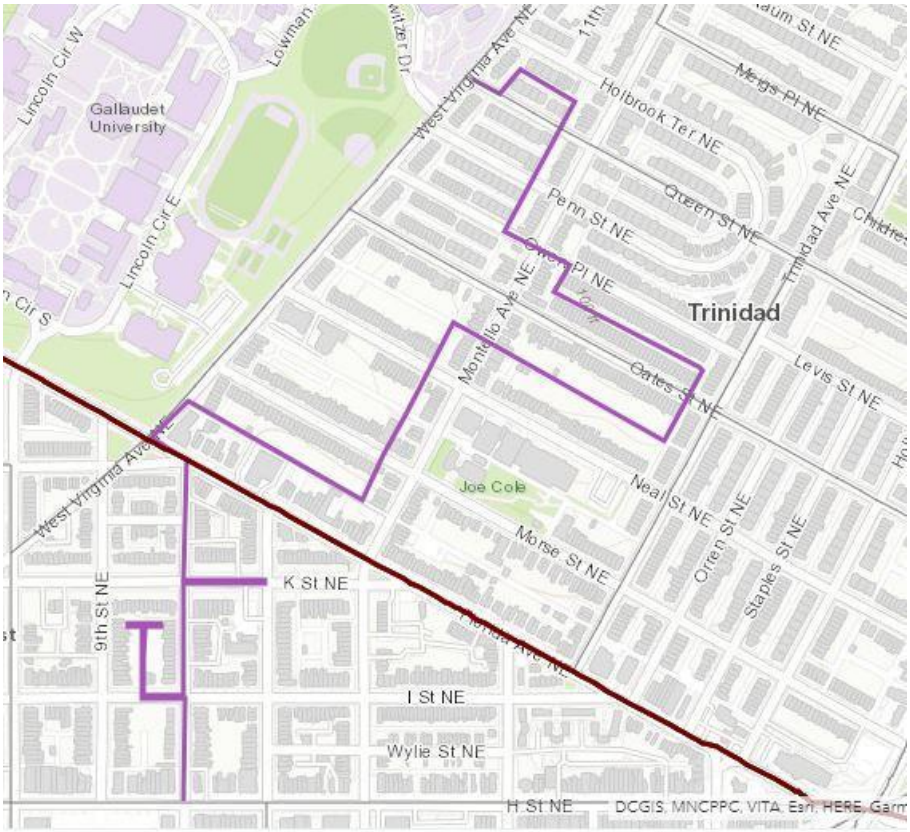


Park View

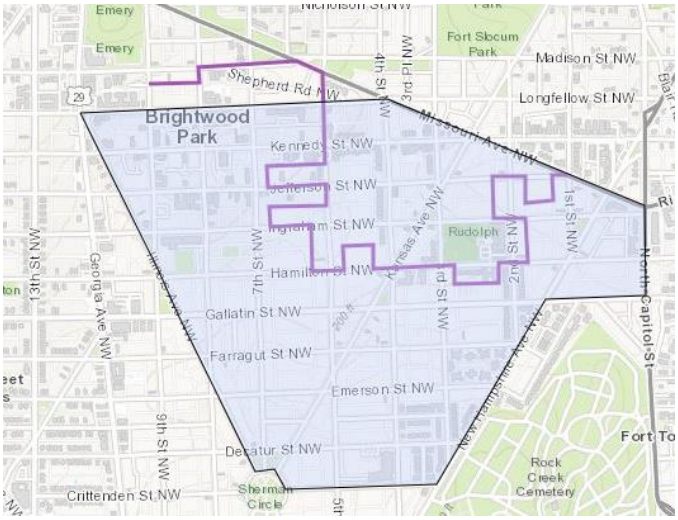


Rosedale/Kingman Park

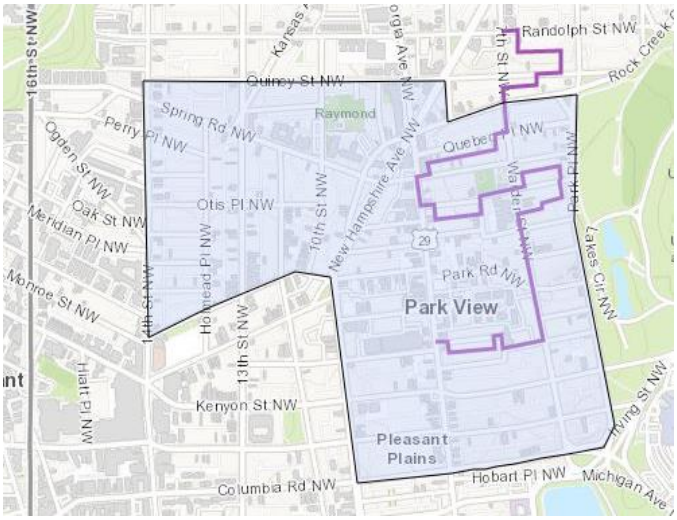
Trinidad



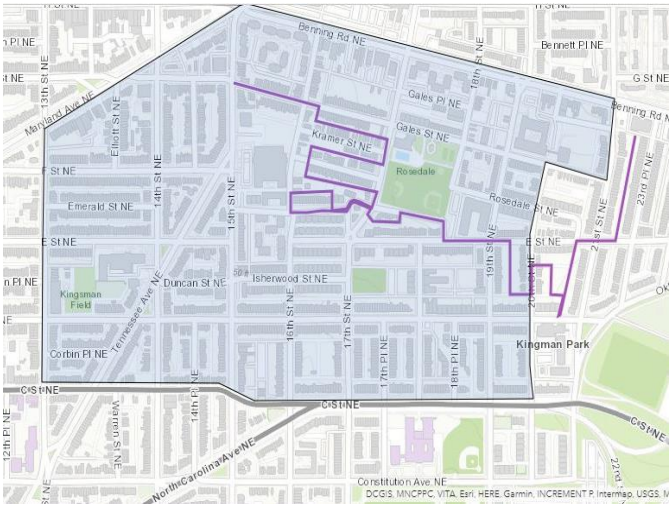
Brightwood



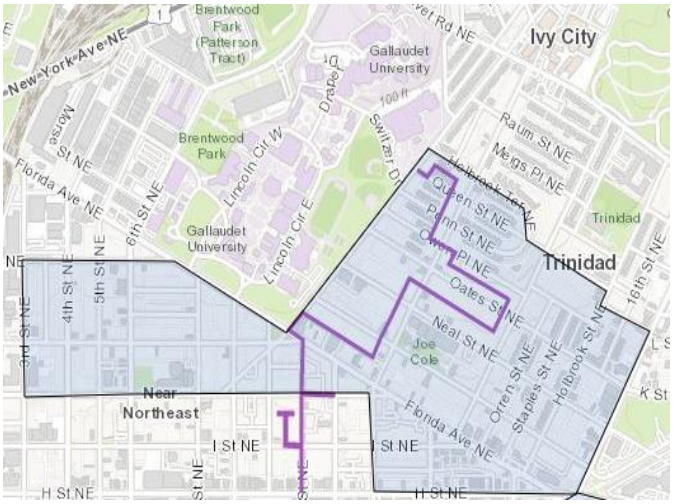
Park View



Rosedale/Kingman Park



Trinidad



The above maps show the pilot's weekly 1-mile data collection routes in the four target neighborhoods with an extra layer – the blue shaded area denotates estimated blocks which received the campaign sticker.

Appendix C. Additional Images Taken During Data Collection

Appendix D. Initial Data Analysis

Neighborhood	Litter Index Score			Overflowing + Open Cans		
	Magnitude	Direction	Significant	Magnitude	Direction	Significant
Brightwood	-0.395	↓	Yes	-1.640	↓	Yes
Park View	-0.066	↓	No	-3.769	↓	Yes
Rosedale Kingman	0.015	↑	No	-1.119	↓	No
Trinidad	0.302	↑	No	-1.706	↓	No
Combined	**-0.071**	↓	**No**	**-2.159**	↓	**Yes**

Neighborhood	Overflowing Cans			Open Cans		
	Magnitude	Direction	Significant	Magnitude	Direction	Significant
Brightwood	-0.500	↓	No	-1.286	↓	Yes
Park View	-2.616	↓	Yes*	-0.031	↓	No
Rosedale Kingman	-1.524	↓	No	0.655	↑	No
Trinidad	-0.068	↓	No	-0.497	↓	No
Combined	**-1.364**	↓	**Yes**	**-0.411**	↓	**No**