

A person wearing a dark jacket and a cap is holding a large black trash bag. The background shows a park with trees and grass.

Trash Receptacle Placement:

Philadelphia Behavioral
Science Research
Protocol

August 2017 - May 2018

The Effect of Various Public Waste
Receptacle Numbers on Litter and Staff
Time

The goal of this project is to address the litter problem in Philadelphia by attempting to determine the number of public trash receptacles that optimizes trash disposal in receptacles as opposed to litter and illegal dumping. This experiment contributes to the debate as to whether increasing or decreasing the number of trash receptacles in an area reduces litter and decreases the amount of staff time spent on cleaning up litter and other waste.



City of
Philadelphia

The Cabinet will also use insights learned from this experiment to plan for future **placement or removal of receptacles in public spaces.**

Executive Summary

From August 2017 to May 2018, the City's GovLabPHL team worked in partnership with the Zero Waste and Litter Cabinet and researchers from local academic institutions to test the effect of various public waste receptacle quantities on the amount of litter and the number of hours staff spend picking up trash. Specifically, this experiment examined how increasing or decreasing the number of public trash receptacles in an area impacts trash collected from within remaining receptacles, trash collected as litter, staff hours spent picking up litter, and the litter index (a new metric for measuring litter) for the area.

The study involved trash receptacles at four parks and four commercial corridors. Each location was planned to receive a manipulation that decreased their number of trash receptacles, a manipulation that increased their number of receptacles, and two non-treatment periods that returned the study location to its original number of trash receptacles. Baseline data were collected previous to the first manipulation, and survey data, trash weight measurements, and the litter index provided metrics to evaluate the outcome. During the experimental period, two commercial corridors were unable to complete the experiment, and therefore data was unavailable or incomplete for these locations.

The results showed that the effect of differing the number of receptacles on trash was varied and inconclusive. The study saw both decreases and increases in the amount of trash collected in locations where trash receptacles were increased and decreased. The results did show that when trash receptacles decreased, trash collected as litter increased and staff time spent on collecting litter also increased. Data on observed litter and via the litter index revealed mixed results on whether or not increased number of receptacles alters the amount of litter in an area.

The Zero Waste and Litter Cabinet intends to use the outcomes of this study to make the economic and operational justification based on litter reduction and reduction in staff hours picking up litter to increase the number of publicly accessible waste receptacles across many assets such as commercial corridors, parks, recreation centers and other highly trafficked streets. The Cabinet will also use insights learned from this experiment to plan for future placement or removal of receptacles in public spaces. Lastly, these experiment results will be used to encourage commercial businesses to "adopt-a-receptacle" to decrease litter around their businesses.

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Background

In December of 2016 Mayor Kenney announced his goal of zero waste by 2035. One major component of achieving this ambitious target is to reduce the amount of litter in Philadelphia. While the City of Philadelphia has figured out relatively effective ways to get litter off the streets, there has been limited work done to prevent littering altogether. The main goal of this research is to determine the most effective ways to keep litter off the streets using the proven methods of behavioral science.

This study was inspired by debates within city government about whether more or fewer trash receptacles result in less litter. In 2011, New York City began experimenting with removing trash receptacles from select public transportation stations. While this effort was initially praised, as it seemed removing the receptacles counter intuitively decreased litter at the stations, recent audits have revealed that the removal actually increased litter and track fires at the affected stations.¹ However, there has been growing interest in the City of Philadelphia and other municipalities regarding the introduction of similar changes. Here, we sought to assess the influence of both increasing and decreasing the number of available trash receptacles in public spaces on citizens' waste disposal.

Specifically, this experiment examined how increasing or decreasing the public trash receptacles in an area impacts trash collected from within remaining receptacles, trash collected as litter, staff hours spent picking up litter, and the litter index (a new metric for measuring litter) for the area.

¹ <https://www.osc.state.ny.us/audits/allaudits/093015/14s29.pdf>

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Relevant Literature

Anderson, Siwan, and Patrick Francois (1997). Environmental cleanliness as a public good: welfare and policy implications of nonconvex preferences. *Journal of Environmental Economics and Management*, 34(3), 256-274.

Cialdini, R.B., Reno, R.R., & Kallgren, C.A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58, 1015-1026.

Finnie, W. C. (1973). Field experiments in litter control. *Environment and Behavior*, 5(2), 123-144.

Grasmick, Harold G., Robert J. Bursik, and Karyl A. Kinsey (1991). Shame and embarrassment as deterrents to noncompliance with the law the case of an anti-littering campaign. *Environment and Behavior*, 23(2), 233-251.

Huffman, Kim T., et al. (1995). Litter reduction a review and integration of the literature. *Environment and Behavior*, 27(2), 153-183.

Luyben, Paul D., and Jon S. Bailey (1979). Newspaper recycling: The effects of rewards and proximity of containers. *Environment and behavior*, 11(4), 539-557.

Reiter, Susan M., and William Samuel (1980). Littering as a function of prior litter and the presence or absence of prohibitive signs. *Journal of Applied Social Psychology*, 10(1), 45-55.

Robinson, S.N. (1976). Littering behavior in public places. *Environment and Behavior*, 8, 363-384.

Schultz, P.W., Bator, R.J., Large, L.B., Bruni, C.M., & Tabanico, J.J. (2013). Littering in context: Personal and environmental predictors of littering behavior. *Environment and Behavior*, 45, 35-59.

Sibley, C.G., & Liu, J.H. (2003). Differentiating active and passive littering: A two-stage process model of littering behavior in public spaces. *Environment and Behavior*, 35, 415-433.

Partner Organizations

This project involved the cooperation and expertise of multiple private and public partners.

City of Philadelphia Partners

Mayor's Policy Office and GovLabPHL

Zero Waste and Litter Cabinet (departments involved from the cabinet listed below)

- Managing Director's Office
- Mayor's Office
- Department of Health
- Department of Commerce
- Streets and Sanitation Department
- Office of Sustainability
- Philly 311

Research Institutions

Temple University
University of Pennsylvania
Swarthmore College

Non-profit Organizations

Keep Philadelphia Beautiful
Fairmount CDC
Francisville Neighborhood Development Corporation
North Broad Renaissance



Study Design

Study Design

This project falls under the category of a quasi-experimental design rather than a pure randomized control trial (RCT). During the planning and implementation of this experiment, the timing of when each site was assigned to each condition was adjusted to take into account local constraints and considerations specific to each site. Thus, the assignment of each site to each condition was not purely random due to these feasibility constraints, making this a quasi-experimental design. Additionally, each site served as its own control, due to the collection of data when the site was in its standard receptacle arrangement.

Subjects

Four parks (two in Brewerytown, two in Port Richmond) and four commercial corridors (all in Brewerytown) initially agreed to participate in the experiment. However, one of the commercial corridors (Beech Interplex) was later unable to participate in any of the interventions or collect the relevant data during the intervention period. As noted in the procedure section, several sites faced challenges in the implementation of the interventions.

Randomization and Experimental Conditions

During this experiment, it was planned that each site would rotate through each of three possible conditions: (1) the status quo (no change in the number of waste receptacles, i.e. the "baseline"); (2) increased availability of waste receptacles; or (3) decreased availability of waste receptacles. During the time period of each condition (time periods noted), the entire site (e.g., whole park, whole commercial corridor) was assigned to that condition.

In this intervention, the times during which a given site had its typical arrangement in terms of the number of waste receptacles (the "status quo") served as the baseline, or control. This approach allowed for comparisons within each specific site and minimized data analysis issues that might arise when there are large differences overall between sites. This was an especially salient concern in this case because of the small number of test sites/corridors and the limited ability to identify other similar "control" sites in the study.

Procedure

All areas had an initial litter index measure collected from March 1, 2017 to April 15, 2017. From April 15, 2017 to May 1, 2017, baseline measures were collected. The first experimental manipulation window began at most sites on May 1, 2017, with other sites starting their manipulations shortly thereafter. For each site, the increase or decrease in available receptacles was intended to be approximately 75% of the typical arrangement.

Both parks and commercial corridors experienced challenges with the initial manipulation. Upon initially removing receptacles on May 1, 2017, Parks discovered that the receptacles in Campbell Square left exposed bolts which might pose a hazard. Thus, Campbell Square and Powers switched conditions in both manipulation time periods, so that Campbell Square had receptacles added that day and Powers had receptacles removed. No other changes in the parks assignments were necessary. From May 1 to May 14, Athletic Square Park and Campbell Square Park increased the number of available receptacles and MLK Park and Powers Park decreased the number of available receptacles. From May 15 to June 4, each park returned to its previous, typical arrangement. From June

5 to June 18, Athletic Square Park and Campbell Square Park decreased the number of available receptacles and MLK Park and Powers Park increased the number of available receptacles. From June 19 onwards each park returned to its original, typical arrangement until the end of data collection around June 30. The receptacles available at each site in each condition are listed in Table 1.

Commercial corridors experienced a few more challenges with the timing of the experimental interventions and, as noted earlier, Beech Interplex was ultimately unable to participate in any of the interventions. On May 4, Francisville decreased available receptacles. On May 9, both Fairmount and North Broad Renaissance added receptacles to their areas. On May 24, all sites ended their manipulations and returned to their typical arrangements. Then from June 9 to July 7, North Broad Renaissance decreased the available receptacles in the area, while from June 15 to July 5, Fairmount decreased the available receptacles in the area. After these respective manipulations in June/July, both North Broad Renaissance and Francisville returned to their typical arrangements. Note that Francisville did not participate in this second manipulation period. The receptacles available at each site in each condition are listed in Table 2.

Table 1:
Receptacle Numbers by Condition - Parks






















	Typical Receptacles	Increased	Decreased
Athletic Square			
MLK			
Powers			
Campbell Square			

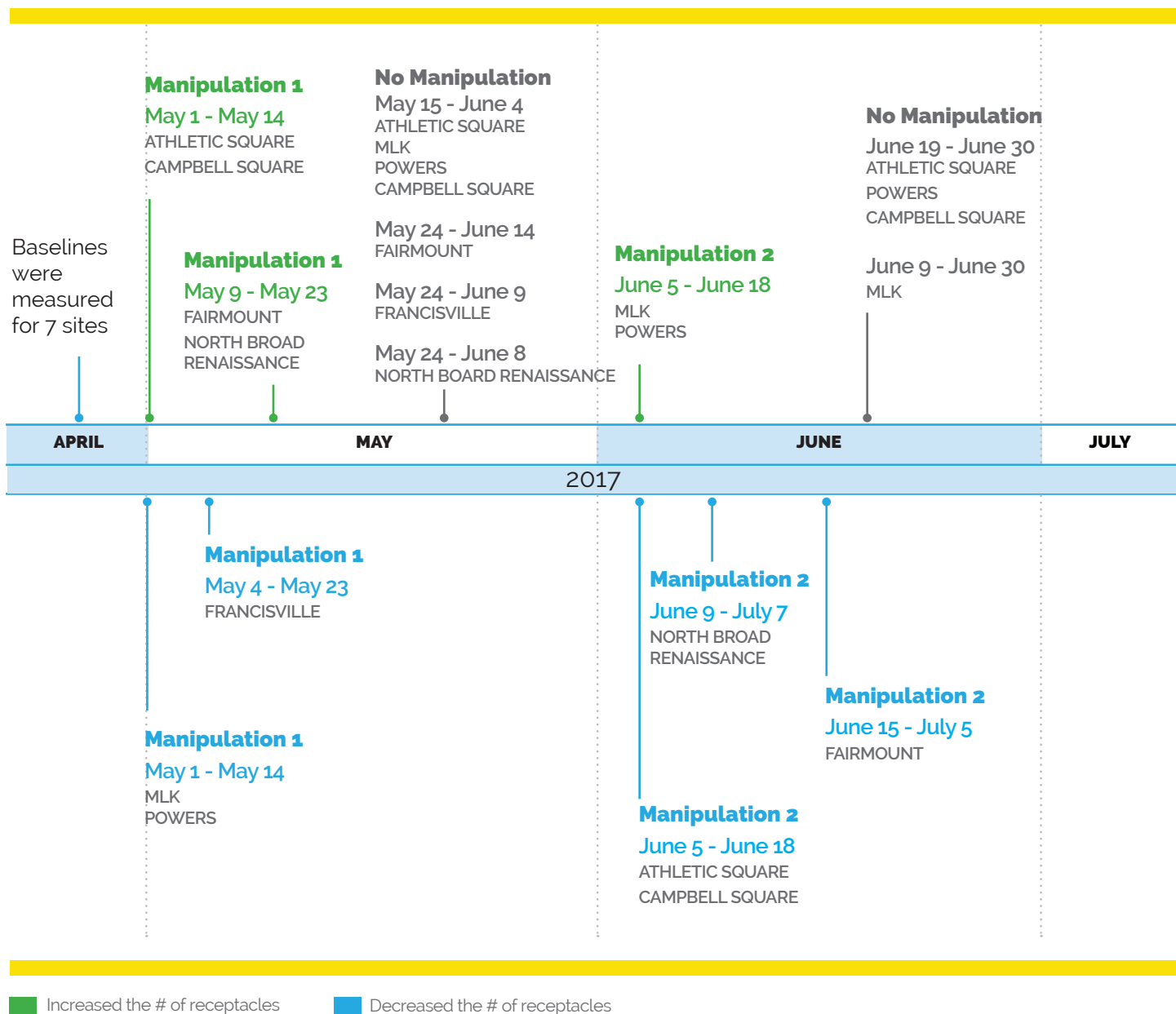
Table 2:
Receptacle Numbers by Condition - Commercial Corridors

	Typical Receptacles	Increased	Decreased
Fairmount			
Francisville		 ²	
North Broad Renaissance			

9 ² This was the planned increased. However, this manipulation did not occur.

Project Timeline

All areas had an initial litter index measure collected from March 1, 2017 to April 15, 2017. From April 15, 2017 to May 1, 2017, baseline measures were collected. The first experimental manipulation window began at most sites on May 1, 2017, with other sites starting their manipulations shortly thereafter.



Hypotheses

It was predicted that increasing the number of receptacles would decrease litter, **whereas decreasing the number of receptacles would increase litter.**

Financial Considerations

There were no significant added expenditures associated with this project. If receptacles were added to areas, these receptacles were supplied through existing Streets Department stock. All receptacles were also removed or added by existing staff, who were already assigned to these waste receptacle duties. The City did pay for incidental labor costs for servicing/emptying additional trash receptacles during the trial period.

However, our intention was to use some of the data from the experiment, such as time spent servicing a greater or lesser number of receptacles as well as time spent picking up more or less litter, to make the financial argument for why policymakers should either increase or decrease public waste receptacles in certain areas. One major impediment to adding more public waste receptacles is having adequate staff to ensure that these receptacles are emptied properly. The goal of these experiments was to give the Zero Waste and Litter Cabinet the clearest possible data on the costs and impact of adding or removing public waste receptacles.

Outcomes

The key outcomes were: trash collected from receptacles, trash collected as litter, staff hours spent cleaning, number of pieces of litter in area (estimate from city personnel), and the litter index. Complaint data and subjective reports were also available from residents and staff.

Data Variables and Collection

Each week, the staff at each site recorded the amount of trash collected as litter, the amount of trash collected from receptacles, and the number of staff hours spent cleaning, using the forms provided (see appendix A). These data were recorded for each day the staff were on site. Approximately once a week, there was also a litter index measure for each site. One member of the Commerce Department completed this measure for the commercial corridors, while the park staff completed these measures for the park sites. For the commercial corridors, the hope was to obtain data from Big Belly trash cans (solar powered compacting trash cans) to determine how much trash was in receptacles. Ultimately, informal data about the number and tenor of complaints was shared to index resident response.

Analysis Plan

In this experiment, each site serves as its own control (i.e. when the site has the typical arrangement of receptacles) and its own point of comparison for each condition. Additionally, given the small number of sites examined, formal statistical analyses were less appropriate in this case. Instead, data were collected and analyzed using more basic statistical methods, and also were qualitatively examined and interpreted.

Results

The results are discussed for each of the key outcome variables. In each section, the findings from the park sites are reported first, followed by the findings from the commercial corridors.

Trash Collected from Receptacles

The amount of trash collected from public waste receptacles daily for each of the park sites is noted in the table 3. Note that this is a measure of trash collected in receptacles, and not the amount of litter collected at each site.

Overall, the findings are somewhat mixed. Given the experiences of New York City's Metropolitan Transit Authority, one might expect there to be less trash collected from receptacles when there are fewer receptacles in an area. Comparing the increased and decreased receptacle data points, this pattern was observed in Campbell Square (2.57 bag reduction) and Powers (0.90 bag reduction). In Athletic (0.37 bag increase) and MLK parks (0.30 bag increase), however, a modest increase in the bags collected was observed. Note, however, that decreasing the number

During the baseline period, they collected **3.85 bags on average from the receptacles**, while 0.15 bags on average were collected from receptacles during the decrease period.

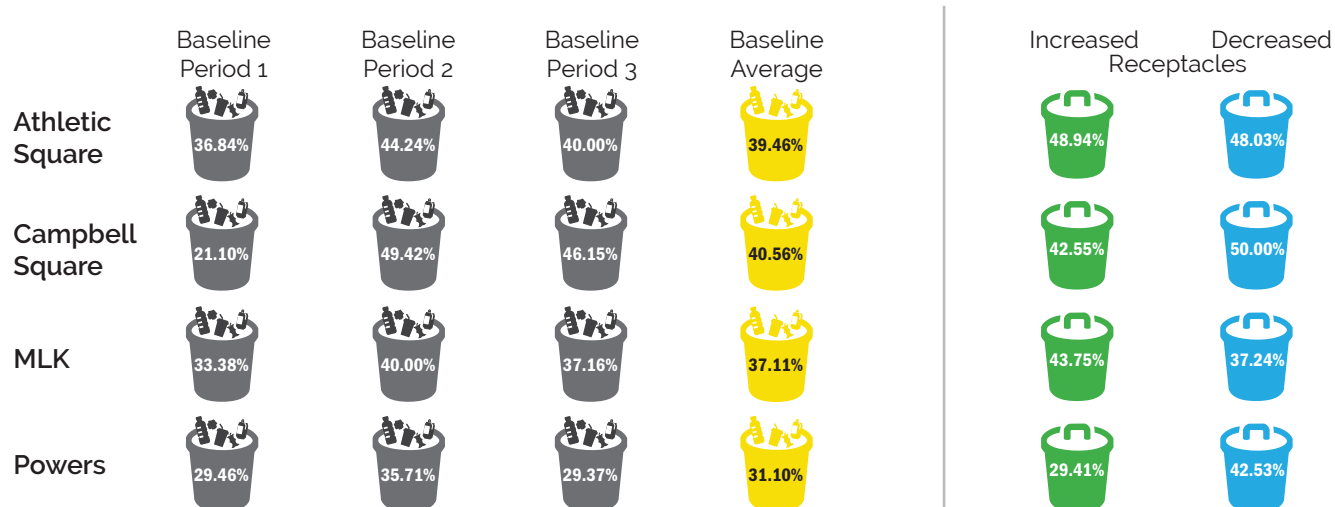
of receptacles reduced the trash collected at all sites relative to the baseline average, which itself was highly variable (making any conclusions more uncertain).

Among the commercial corridors for the first manipulation, only Francisville reported the amount of trash collected from receptacles, as the main receptacles located at Fairmount and North Broad Renaissance were Big Bellies, solar powered compacting trash receptacles, and therefore not serviced by the commercial corridor staff. Francisville only participated in the baseline and decrease conditions. During the baseline period, they collected 3.85 bags on average from the receptacles, while 0.15 bags on average were collected from receptacles during the decrease period. This is consistent with the notion that less trash will be collected from receptacles when there are fewer receptacles available.

Table 3: Bags of Trash Collected by Site and Condition - Parks

	Baseline Period 1	Baseline Period 2	Baseline Period 3	Baseline Average	Increased Receptacles	Decreased Receptacles
Athletic Square	6.67	3.00	2.25	3.97	2.40	2.77
Campbell Square	4.30	3.46	4.38	4.05	5.40	2.83
MLK	4.57	5.25	4.33	4.72	2.70	3.00
Powers	2.73	1.80	2.67	2.40	2.40	1.50

Table 4: Litter as a Percentage of Total Trash by Site and Condition - Parks



Trash Collected as Litter

Because the overall amount of trash varied across each site and each time period, we examined litter as a percentage of the trash collected at each site. Higher numbers indicated more trash was littered, whereas lower numbers indicate more trash was properly disposed. The percentage of trash that was collected as litter daily for each of the park sites is noted in the table 4.

We expected more litter to be observed in the decrease compared to the increase condition. This pattern was observed at both Campbell Square (7.5% increase in litter) and Powers (13.1% increase in litter). The percentage of trash collected as litter was somewhat stable at Athletic (0.9% decrease in litter), while there was an observed decrease in litter at MLK (6.51% decrease in litter). Averaging across all sites, decreasing the number of available receptacles increased the

percentage of trash collected as litter daily by 2.9% each (compared to increasing the number of available receptacles).

Among the commercial corridors, a clearer pattern regarding litter emerged. Although Francisville only collected data during the baseline and decrease periods, the percentage of trash that was collected as litter versus from a receptacle increased dramatically when there were fewer available receptacles, to 95.84% from 39.37%. Fairmount did not have data available for the amount of trash collected from receptacles, since they did not service the receptacles. The overall number of bags of trash collected as litter increased slightly when the number of receptacles was decreased (5.38 bags) compared to when it was increased (5.33 bags). Although representing a change of .05 bags, noise from the data and the limited sample size makes the change vulnerable to fluctuation.

The percentage of trash that was collected as litter versus from a receptacle **increased dramatically when there were fewer available receptacles**

Table 5: Staff Hours Spent Cleaning by Site and Condition - Parks

	Baseline Period 1	Baseline Period 2	Baseline Period 3	Baseline Average	Increased Receptacles	Decreased Receptacles
Athletic Square	6.28	5.69	5.25	5.74	5.65	5.78
Campbell Square	1.18	7.38	10.25	6.27	5.25	9.67
MLK	2.93	3.88	2.89	3.23	2.95	3.06
Powers	1.06	4.30	5.00	3.45	4.90	1.90

Total Staff Hours Spent Cleaning

The number of staff hours spent cleaning at each of the park sites is noted in the table 5:

We expected staff to spend more time cleaning in the decrease compared to the increase condition. This pattern was observed at three out of four sites: Campbell Square (4.4 hour increase), Athletic (0.1 hour increase), and MLK (0.1 hour increase). Conversely, Powers reported spending less time cleaning when the number of receptacles was decreased (3.0 hour decrease). Averaging across all sites, decreasing the number of available receptacles increased the staff time spent cleaning by approximately 0.4 hours each day (compared to increasing the number of available receptacles).

Among the commercial corridors, only Francisville reported data on the amount of staff hours specifically spent cleaning each day. There was a marked increase in the amount of staff time spent cleaning litter when the number of receptacles was decreased (4.58 hours) compared to the baseline (2.64 hours).

Our hypothesis that staff members would spend less time cleaning up litter when there was adequate receptacle coverage generally held true. We did not collect data on what other duties the staff completed, if any, with this extra labor time. However, our intention is to use this data to inform Parks and Recreation, Streets Department, Commerce Department and other departments and organizations tasked with cleaning of our results so that maintenance staff may have more time for other duties when the need to pick up litter is alleviated.

Averaging across all sites, decreasing the number of available receptacles increased the staff time spent cleaning by approximately 0.4 hours each day

There was a marked increase in the amount of staff time spent cleaning litter when the number of receptacles was decreased (4.58 hours) compared to the baseline (2.64 hours).

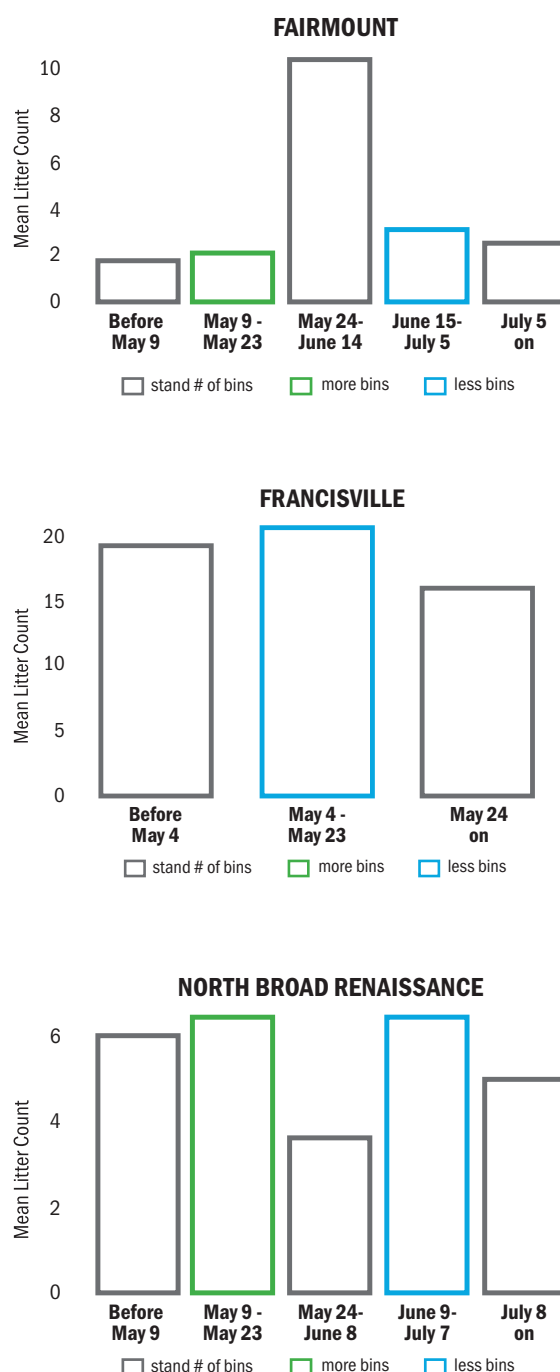
Estimates of Litter

For both the parks and corridor locations, there were estimates for the number of pieces of litter at a given location, taken at periodic intervals. By comparing these estimates from time periods when the number of receptacles was at, above, or below the typical levels, we can get a better sense of how the number of receptacles impacted the amount of litter.

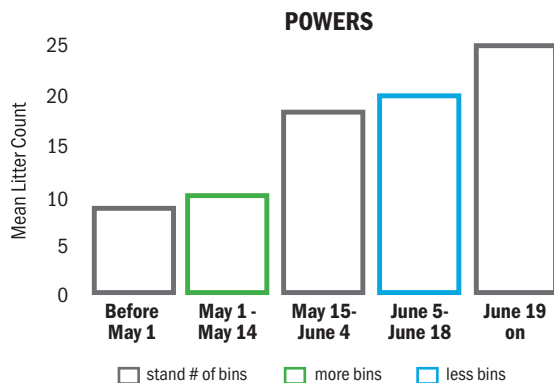
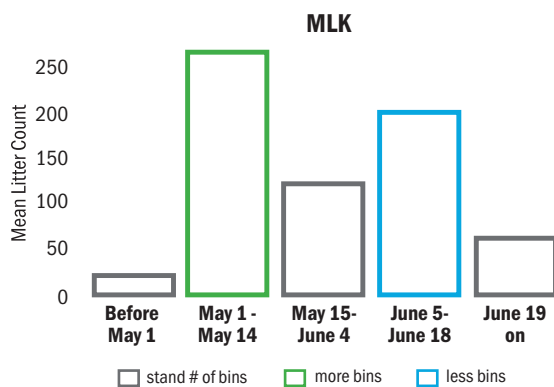
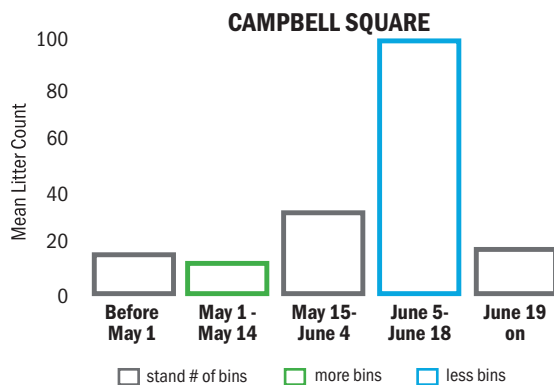
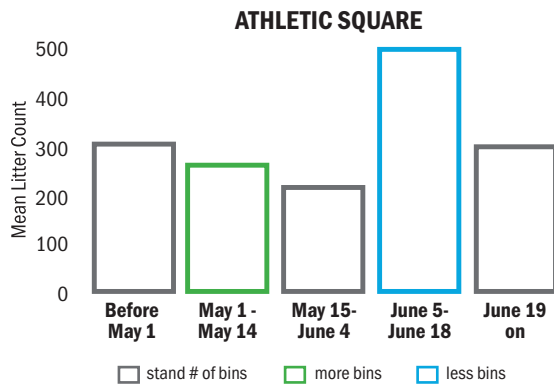
The figures 1a - 1c depict the mean values from all parks and corridor locations for the amount of litter, as a count estimate by city staff, during the various experimental periods. Note that red bars correspond to time windows when the number of receptacles was low, green bars correspond to time windows when the number of receptacles was high, and gray bars correspond to time windows when the number of receptacles were at the typical levels.

Our hypothesis is that when there are fewer receptacles, we should see more litter, and that the opposite would be true when there are more receptacles. For the commercial corridors, the evidence on this is rather weak, due perhaps in part to highly variable litter counts during baseline periods. That is, when simply comparing high- and low-receptacle periods, we do see the expected result that more receptacles are correlated with slightly less litter (in Fairmount and North Broad Renaissance), though these effects seem statistically minuscule. However, the comparisons to baseline periods are distorted by some quite high and quite low litter counts during baseline periods.

Figures 1a-1c: Litter Counts - Commercial Corridors

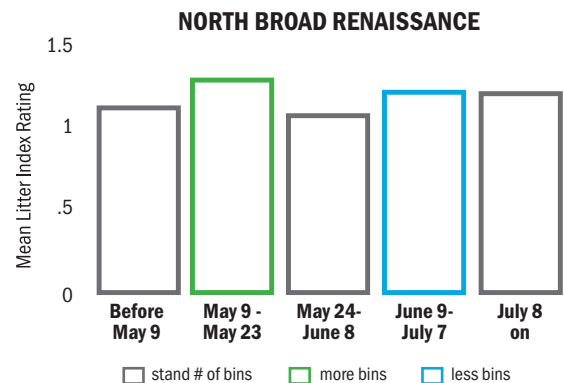
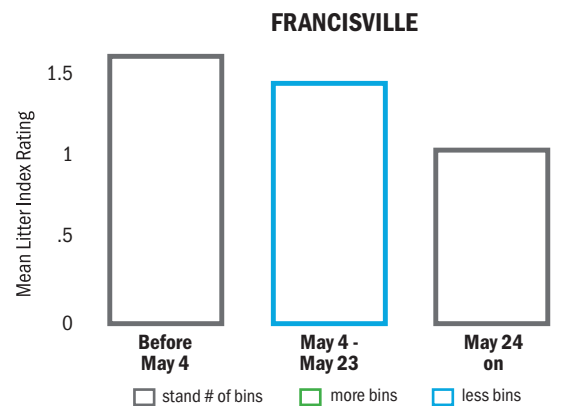
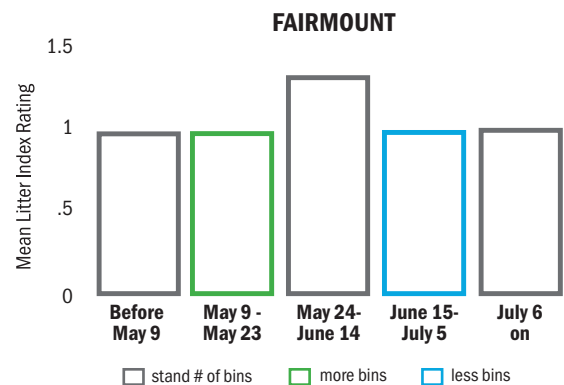


Figures 2a-2d: Litter Counts - Parks



Meanwhile, for the park locations, the hypothesized pattern played out for low-receptacle-number periods in three of the four sites, namely Athletic, Campbell, and MLK, where much more litter was observed when there were fewer receptacles. However, the results for high-receptacle-number periods relative to the baseline turned up more mixed findings; that is, more receptacles do not seem to be clearly associated with less litter than the typical "baseline" number of receptacles.

Figures 3a-3c: Litter Index - Commercial Corridors



Litter Index

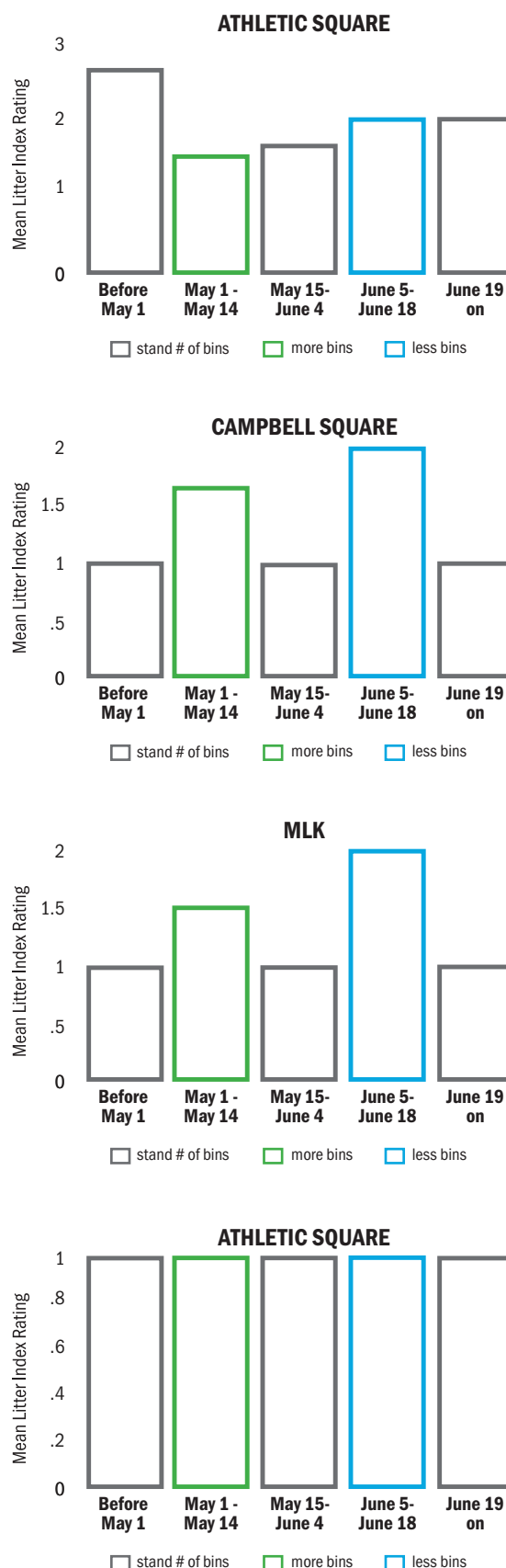
For both the parks and corridor locations, there were also periodic litter index measures, which ranged in the data from 1 to 4 (with higher values corresponding to more litter). By comparing these values from time periods when the number of receptacles was at, above, or below the typical levels, we can get a better sense of how the number of receptacles impacted the amount of litter.

The figures 4a - 4d depict the mean values of the litter index measures from all parks and corridor locations taken during the various experimental periods. Note that red bars correspond to time windows when the number of receptacles was low, green bars correspond to time windows when the number of receptacles was high, and gray bars correspond to time windows when the number of receptacles were at the typical levels.

Our hypothesis would be that when there are less receptacles, we should see higher values for the litter index, and that the opposite would be true when there are more receptacles. For the commercial corridors, the evidence on this is not particularly compelling, with no strong indication that the litter index measures are affected by the number of receptacles in the commercial corridors.

Meanwhile, for the park locations, there are also mixed findings, with no clear pattern emerging that relates the number of receptacles to the litter index measures in any systematic way. These similar mixed findings at both the park and corridor sites is potentially driven by the low level of variance in the litter index measure in the data. One actionable finding here is that the existing litter index measure may be too coarse a metric (approximately 72% of the litter index measures were "1"). That is, perhaps the litter index measure would benefit from modification to make it a more continuous (and less "clumpy") measure of litter levels (a 0-10 scale, for example).

Figures 4a-4d: Litter Index - Parks



Complaints and Other Subjective Outcomes

The Cabinet worked with Parks and Recreation and Streets Department public relations staff to track comments on both social media and those sent directly to the department. Although there was not a large volume of complaints, the few that were received were quite passionate in nature. All comments came when receptacles were taken away. Some examples include:

- A resident of Campbell Square used very obscene language in a social media post that called into question the competency of City government for taking receptacles away.
- Some business owners in Powers Park reported dog owners putting dog waste in a USPS mailbox to protest the removal of receptacles.
- The Streets Department received irate social media messages that questioned why the Big Bellies were still wrapped.

On the converse, Campbell Square maintenance employees received many thanks from the neighbors when more receptacles were added. This subjective feedback followed the previously observed trend that residents in Philadelphia want more trash receptacles in their public spaces and exhibited frustrations when these receptacles are removed.



Ethical Concerns

There were minor concerns over residents and businesses being upset about the removal of trash receptacles. Ultimately, some businesses and residents did express discontent on social media and within the community about the removal of the receptacles. However, it was deemed necessary for the research. On the converse, there were positive comments made by businesses and residents in some instances when receptacles were added. Some residents also questioned why this was happening and seemed unnerved that for some reason beyond their control, the City was adding and removing receptacles.

Recommendations

- Increase the number of publicly accessible waste receptacles across many assets such as commercial corridors, parks, recreation centers and highly trafficked streets.
- Use a combination of the Litter Index, the mapped waste receptacles and this experiment to better understand the right formula of how many receptacles should be in each area.
- Use the results from this experiment to reinforce our current business outreach campaign to ensure businesses fulfill their public waste receptacle requirement; we can also use this data and our mapping to justify an expansion of the "adopt-a-receptacle" program beyond block captains.

Follow-Up

A major impetus for conducting this experiment was an operational debate that occurs in many City operating departments that deal with trash between the adding and removing of public waste receptacles. Some operations staff err on the side of public opinion that Philadelphia needs more public waste receptacles, while others disagree and feel that removing receptacles will prevent household trash dumping and force people to either hold onto their trash or waste less. The Zero Waste and Litter Cabinet and other City operating departments intend to use the outcomes from this experiment to craft policy and regulation in the following three areas:

1. We intend to use the data from the experiment to make the economic and operational justification based on litter reduction and reduction in staff hours picking up litter to increase the number of publicly accessible waste receptacles across many assets such as commercial corridors, parks, recreation centers and other highly trafficked streets.
2. The Office of Innovation Technology, which is responsible for the Litter Index, is currently mapping all public waste receptacles in the City of Philadelphia. Although our overall goal is to increase receptacles, in some areas where there is an abundance of receptacles, we may need to decrease to the right number for proper maintenance of all receptacles. The Zero Waste and Litter Cabinet will use a combination of the Litter Index, the mapped waste receptacles and this experiment to better understand the right formula of how many receptacles should be in each area.
3. There are certain businesses, such as those that sell prepared or packaged food, that are required to have public waste receptacles in front of their businesses. We also have a program for block captains to "adopt-a-receptacle", which allows block captains to legally place public waste receptacles on the street. The Zero Waste and Litter Cabinet will use the results from this experiment to reinforce our current business outreach campaign to ensure businesses fulfill their public waste receptacle requirement. We can also use this data and our mapping to justify an expansion of the "adopt-a-receptacle" program beyond block captains.

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Appendix A

Waste Collection Tracking Slip



PHILADELPHIA
PARKS &
RECREATION

Waste Collection Tracking Slip

Bin Placement Experiment

Site: _____ Week: _____

Employee: _____

Day of Week	Mon.	Tues.	Wed.	Thur.	Fri.
# of Trash Bags from Cans					
# of Trash Bags from Litter					
# of Total Hours Picking Up All Bags of Waste					

Comments: _____