

Using Behavior-Change Strategies to Reduce Littering in Lambeth



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WPI



Using Behavior-Change Strategies to Reduce Littering in Lambeth

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Abstract

Lambeth, a central London borough, has transportation hubs and attractions that draw a lot of foot traffic, and thus a lot of litter. Currently Lambeth Council issues Fixed Penalty Notices (FPNs) to people caught littering, but these FPNs have not reduced littering to the Council's satisfaction. The team used research into the psychology of behavior-change, analysis of proven campaigns, and observations in the Borough to design pilot advertisement campaign posters focused on reducing cigarette litter. These posters were affixed to litter bins at transportation hubs in the Borough, and results showed that our campaign was successful. The team then developed five recommendations offering other avenues for the Council to address littering.

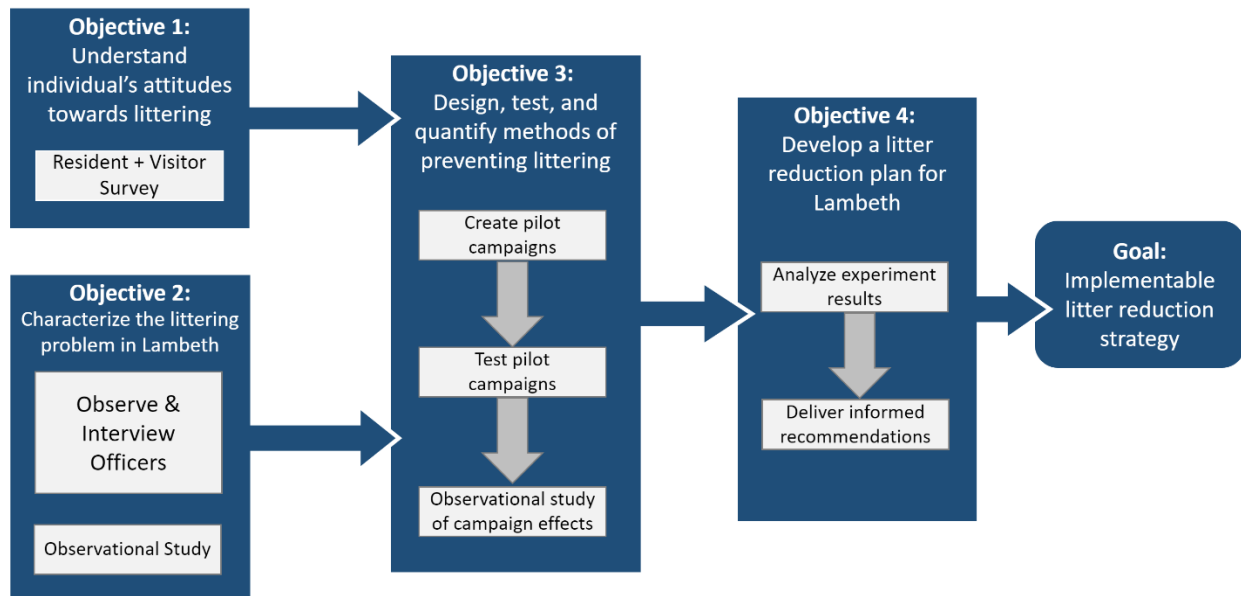
Executive Summary

The accumulation of litter in cities is not only aesthetically unappealing, but it represents a serious threat to societies and their inhabitants. Annually, over 4.5 trillion cigarette butts are littered worldwide; these butts contain toxic chemicals which represent a serious threat to our environments (“The Facts About Litter,” 2017). Ultimately, responsibility falls on local governments to delegate and fund cleanup efforts, which cost the United Kingdom upwards of £663 million in 2018.

Street litter accumulates in areas with high foot traffic and where people loiter. In Lambeth, this is around major transportation hubs, such as Waterloo, Vauxhall, and Brixton stations, and tourist attractions like the London Eye, Royal Festival Hall, and the London Aquarium (A. Brandon, A. Skilton, & G. Brown, phone interview, November 13, 2019; “Video Tour of Lambeth in London,” 2015). Currently, Lambeth Council issues Fixed Penalty Notices (FPNs) as their primary tool to reduce littering. These FPNs require that offenders pay £150, which can be reduced to £100 if paid within the first ten days, to bypass a court trial. The officers responsible for issuing FPNs are contracted by the Council and work for a company called APCOA (APCOA Parking, 2016).

Project Goal and Methodology

The goal of this project was to develop and test an implementable anti-littering strategy to assist Lambeth Council in addressing the problem of excessive littering in their borough. To accomplish this goal, the team spent the first seven weeks of our project at WPI developing objectives with corresponding tasks. These objectives were completed sequentially and built off of each other to reach our goal. A model of our objectives, with each specific task shown in a white box, is presented in the figure below:



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As shown in the figure, the first two objectives primarily featured data collection and were conducted simultaneously. Information gathered from these objectives allowed us to design and test a littering reduction campaign. Based on the success of our campaign and our research into effective anti-littering strategies, we were able to develop a litter reduction plan and ultimately accomplish our goal.

Design and Implementation of The Anti-Littering Campaign

In Lambeth, cigarette butt littering is widespread, what most FPNs are cited for, and easy to observe and quantify compared to other forms of litter. Therefore, we narrowed the scope of our campaign to focus on cigarette-related litter at three major transportation hubs: Brixton Station, Waterloo Station, and Vauxhall Station. We then conducted a baseline (pre-campaign) study where we counted the number of cigarettes that were properly disposed of, improperly disposed of, and littered. These observations were conducted at each location during the morning commute and then again at lunchtime; once completed, this study contained 299 cigarette disposals with a litter rate of 45%.

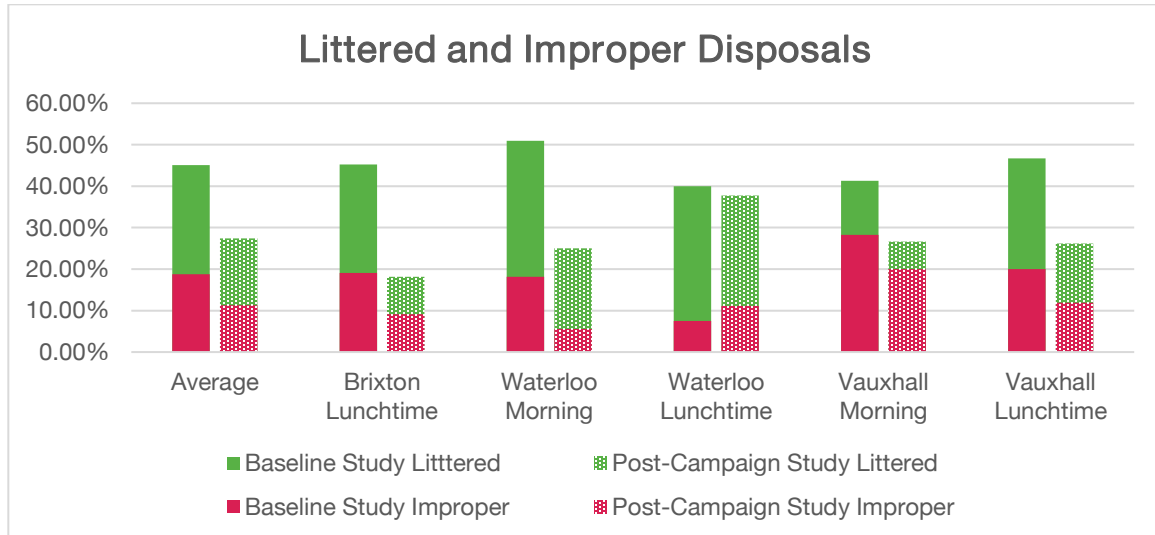
After conducting our baseline study, we designed advertisement campaign posters: one of which is displayed above. These posters built off of the results of our survey, where respondents demonstrated a sense of community attachment, using phrases like “our landmarks” and images of widely recognized Lambeth landmarks. Through interviews, officers indicated that FPNs on their own were not changing behavior; however, officers thought that making people aware of the magnitude of littering fines could have an impact. To incorporate this in our poster, we placed the size of the fine in white text on a black box which contrasts with the background and catches people’s eyes. Finally, during our officer observations we watched as cigarettes were repeatedly stubbed out and left on top of litter bins. To address this, we added small triangular stickers which were affixed to the tops of bins, near the stubber plate, with the message “Ash it and Trash it” to instruct smokers to properly dispose of their cigarette ends. We then repeated the procedure of our baseline study to determine if there was a significant change in the percentage of cigarettes that were littered.



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Results of The Campaign

After our post-campaign studies were completed, we calculated the percentage of cigarettes that would become litter (littered plus improper disposals) dropped to 27.5%, which was a 39% reduction from the 45% in our baseline study. This result was statistically significant ($p < 0.5$), with a p-value of .008.



In locations where our bin topper was present (Waterloo and Vauxhall), we recorded a 37% decrease in improper disposals from 18.7% to 11.8% ($p = .08$). This result is not sufficiently statistically significant; however, we noticed through the course of our study that many individuals noticed our stickers and appeared to read them and proceeded to cautiously stub out their cigarette and throw butts away like it was perhaps their first time. Due to this, we believe that placing educational messages on top of bins could reduce the amount of cigarette litter.

Recommendations for Lambeth Council

Based on our findings we came up with five recommendations for Lambeth Council to, over time, reduce the amount of street litter in their borough:

1. Future anti-littering advertisement campaigns,
2. Ashtray and litter bin design improvements,
3. Locations of litter bins,
4. Volunteer litter cleanup events, and
5. Student education about littering.

Future Anti-Littering Advertisement Campaigns

This recommendation is based largely on the success of our own campaign and provides suggestions for Lambeth Council in their own advertisement campaign. When designing their posters, the Council should build off their resident's community attachment and display the

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monetary penalty of FPNs. We recommend they begin educating smokers on improper disposals by issuing FPNs. Finally, their campaign should be implemented in high traffic areas like transportation hubs and around tourist attractions.

Ashtray and Litter Bin Design Improvements

During our time in Lambeth, we observed many flaws in current litter bin designs. We recommend that future litter bin designs include large, easy to use ashtrays, clearly visible stubber plates, and two compartments that allow for easy disposal of waste and recycling. Since this could be costly and a long-term change, in the meantime, we suggest that the Council clean the ash and grime off litter bins to nudge patrons to properly use bins.

Locations of Litter Bins

We were also tasked with identifying if the current placement of litter bins was effective. We noticed most bins were placed curbside, with lots of bins distributed around major transportation areas and bus stops. We observed one particularly poor placement outside of Vauxhall station, where bins were irregularly clustered together. We recommend that Lambeth Council redistribute these bins to cover a wider area. Another behavior that we observed was that smokers often smoked near station entrances where there were no accessible litter bins. We recommend that the Council consider placing ashtrays by the entrances to give smokers a convenient way to properly dispose of their cigarettes.

Volunteer Littering Cleanup Event

One effective campaign that consistently came up in our research was a community cleanup day. We found that 54% of residents showed interest in a cleanup event. By organizing a community cleanup, the Council would spread awareness about the litter problem and help to create a clean environment where people will be less likely to litter. To help accomplish this, we recommend the Council work with local businesses to help fund an annual event.

Student Education About Littering

Our final recommendation was to educate the younger population about the negative impacts of littering. This could be done in an individual classroom or schoolwide setting. After students learn about the negative effects, we recommend they apply their knowledge by either creating anti-littering posters or painting litter bins with classmates that could be used by the Council.

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1.0 Introduction

Antisocial behavior, such as littering, is an attack on public space, and by extension the people who function within it. Over 4.5 trillion cigarette butts are littered each year, containing toxic chemicals that represent a serious threat to environments around the world (“The Facts About Litter,” 2017; CENN, 2019). In urban settings, street litter can contaminate water systems and even cause car accidents (Gabbatiss, 2018). Efforts to clean up litter are expensive, amounting to over £663 million in England in 2018, and it is up to local communities to pay these hefty cleanup costs (Ministry of Housing, Communities & Local Government, 2019; CENN, 2019). Citizens and businesses ultimately shoulder the burden of public litter, which can increase crime, worsen public health, hurt businesses, harm the local environment, reduce tourism, and cut into already tight public budgets (Lewis, A., Turton, P., & Sweetman, T, 2009).

The Borough of Lambeth, located in the heart of London, is home to over 325,000 residents, with hundreds of thousands of people traveling through it each day (Video Tour of Lambeth in London, 2015). Studies have shown that 99% of streets in town centers, such as Lambeth, contain cigarette litter which combines with the rest of the types of littering to make over 30 million tons of litter collected from streets in England each year (Kingdom Services Group, n.d.). Lambeth Council spends £7 million annually to sweep streets and collect litter that is dropped primarily around major transportation hubs like Waterloo Station and attractions like the London Eye in the northern end of the borough (Lambeth Council, 2019).

The Council issues Fixed Penalty Notices (FPNs) as its primary tool to reduce littering. This earned the council only £503,510 in the span of two years— far short of the money required to clean the litter up. In 2019, they elected to raise their FPNs from £80 to £150 in order to match other London boroughs’ 2019 FPNs and to help offset the cost of cleaning their streets. When the Council reported their decision to increase FPNs, they also suggested that the Borough build community awareness and promote the use of ashtrays and litter bins (Lambeth Council, 2019).

Despite the Borough’s recently increased FPNs, the littering problem in Lambeth persists, leading the Council to search for alternative approaches. Lambeth Council’s Highways and Environmental Enforcement Team is investigating additional innovative measures that aim to change people’s behavior, rather than targeting their wallets. Behavior-change approaches have been successful before, such as the Great British Spring Clean where volunteers donated over 1.1 million hours to accumulate close to one million bags of litter (Great British Spring Clean, 2019). The goal of this project is to develop and test an implementable anti-littering strategy that will assist Lambeth Council in addressing the problem of excessive littering in their borough. We plan to achieve this goal through four main objectives:

- To understand individuals’ attitudes toward littering in Lambeth,
- To characterize the littering problem in Lambeth,
- To design, test, and quantify methods of preventing littering, and
- To develop a litter reduction plan for Lambeth.

2.0 Background

This chapter begins by explaining why littering is a burden to society, then examines which people are most likely to litter, and describes times and places littering most often occurs. Next, it examines Lambeth itself, the specifics of its littering problem, and how the Council currently mitigates littering. We then researched the psychology behind littering and how, from a psychological standpoint, to best influence and change this behavior. Finally, we examined both successful and unsuccessful campaigns meant to reduce littering in other parts of the world and compared common qualities that would be helpful for us to pursue or avoid in our proposed plan to the Lambeth Council.

2.1 Littering Background

Most British people view the accumulation of litter, especially in dense urban environments, as aesthetically unappealing, with 81% reportedly feeling frustrated or angry at the sight of it (Kolodko, Read, & Taj, 2016). Litter is not only an unattractive sight but has many more negative impacts to individuals and societies alike. Public officials delegate the cleaning of littered trash from the streets of Great Britain to third-party companies, which costs taxpayers upwards of £500 million each year, not accounting for cleaning parks or other public spaces (“The Facts About Litter,” 2017).

Litter is also a burden and danger to society at large. Littered areas have been shown to damage community spirit, well-being, and health, while areas that appear well cared for can increase positive emotions, helping to encourage both physical activity and social integration among the public (Kolodko et al., 2016). Littering also has a negative impact on national well-being, a measure of national prosperity and happiness by which countries are ranked, which has recently become a priority for many nations (Kolodko et al., 2016). Litter can even reduce tourism, as tourists typically avoid staying in or visiting littered areas (Caucasus Environmental NGO Network, 2019). Litter has also shown to impact public transportation. For example, in the three years from 2015-2017, 1,348 trains were delayed on the London Underground network due to litter for an average delay of 5.4 minutes (Transport for London, 2018). In addition, improperly disposed of cigarettes pose a potential fire hazard in an urban environment, and some retailers have even reported having to extinguish bin fires outside their establishments (Patel, Thomson, & Wilson, 2013). All of these factors make eliminating litter from populated areas highly important for both individuals and nations.

Littered trash has a significant negative impact on nature and the environment as well. Litter that finds its way into waterways can drastically harm the marine environment, including the physical habitat, aquatic life, and even humans. This is especially significant in the northern districts of Lambeth, whose border is formed by the River Thames, a waterway that empties into the Atlantic Ocean. The physical structure of marine habitats can be altered and obstructed by trash and debris, thus inhibiting their ability to support aquatic life (Environmental Protection Agency, 2015). Litter may also contain toxic chemicals or absorb other hazardous pollutants from the environment and transport them into aquatic areas (Keep Britain Tidy, n.d.;

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Environmental Protection Agency, 2015). Once litter reaches the water, it poses threats to wildlife that include entanglement and both physical and toxicological dangers if ingested. Chemicals carried by litter can spread through the food chain, harming not only aquatic animals, but even humans who consume seafood (Environmental Protection Agency, 2015).

2.1.1 Determining Who Litters

Most everybody would categorize the sight of urban litter as unpleasant; therefore, the question becomes who is dropping litter in the first place. One study of UK residents found that 48% of people admitted to littering, and that 122 tons of cigarette-related litter is dropped daily across the UK (“The Facts About Litter,” 2017). Littered cigarette butts contain toxic chemicals like nicotine and arsenic that can pollute soil and groundwater, which can contaminate water systems and spread disease (CENN, 2019). In the UK, 14.7% of adults smoke, equating to just over seven million smokers, and these numbers are reflected in Lambeth where 14.6% of people smoke, almost 50,000 people (Office for National Statistics, 2019a; London Loves Business, 2019). Clearly smoking behavior, and subsequently cigarette litter, are very prevalent in the UK and Lambeth, so smokers are a broad category of people responsible for littering that must be targeted in any effective anti-littering campaign.

Researchers have studied smokers to find differentiating factors and to determine who among them is most likely to litter. In one observational study conducted in Wellington, New Zealand, a dense urban environment not unlike Lambeth, researchers witnessed 219 cigarette butts discarded over a 40-hour span. They found that 76.7% of cigarettes were littered on the street or in sewer drains and gutters (Patel et al., 2013). The researchers were able to find categories of smokers that are more likely to litter than others. For instance, they found that the method of extinguishing one’s cigarette significantly altered the likelihood of them littering the butt. Those who did not extinguish their cigarette littered it 94.4% of the time, while those who extinguished by hand only littered in 4.5% of cases. Smokers who extinguished their cigarette by foot pressure on the pavement saw a 100% litter rate (Patel et al., 2013).

There have also been studies to determine who from the general public are the most likely litterers. Factors like age have been found to correlate to littering behavior and attitudes. One group from Policy Exchange surveyed and interviewed citizens and authorities in the UK and found that 20% of people admitted to littering within the past year; 38% of these litterers were 18-24-year-olds and only 9% were 65 or older, indicating that younger generations are more persistent litterers (Lewis et al., 2009). Research has shown that students are among the most common litterers and that young people are even more likely to litter in groups (Lewis et al., 2009). Lewis et al. (2009) also found that the most prominent group of litterers was young urban males who lack a sense of community attachment, leading the researchers to believe that littering behavior is a symptom of an overall failure to engage these people in society.

2.1.2 Likely Times and Locations of Littering

After characterizing who is most likely responsible for littering, it is important to understand when and where most littering takes place to be able to efficiently attack the problem. Through surveys of UK residents, Campbell (2007) learned that littering behavior was observed

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anywhere large groups of people were found, including locations like train stations, city centers, concerts, sporting events, and schools. Those surveyed also reported observing higher rates of littering at night, when fueled by drunkenness, and at mealtimes, like lunch and dinner, when people are eating on the go. Evening and nighttime spikes in littering behavior are supported by the smoker observation in Wellington which determined smokers in the evening are significantly more likely to litter their butts, with an 85.8% litter rate, than lunchtime smokers by almost 20 percentage points (Patel et al., 2013). Some speculative reasons for this difference include less prohibitive social norms and an increase in urban visitation outside of working hours, or the potential for drug or alcohol use in the evening to lower adherence to social norms (Patel et al., 2013).

2.2 Littering in Lambeth

Lambeth is one of twelve boroughs that make up Inner London. As the fifth largest Inner London borough, Lambeth stretches north to South Bank on the River Thames and south to Streatham Common and Norwood. With a population approaching one-third of a million, Lambeth is also the fifth most densely populated borough in London (Office for National Statistics, 2019b). Lambeth contains a large commercial scene with just under 1500 licensed premises, including many popular shops, restaurants, and cafés spanning from Waterloo Bridge to Vauxhall Bridge (Siebrits, 2018; “Video Tour of Lambeth in London,” 2015). Traveling south gives way to the residential areas of Brixton, a vibrant community shaped by a diverse cultural history, and Streatham (“Living in the London Borough of Lambeth,” 2019).

Lambeth is a residential borough. This is because many young working-age individuals, from the UK and abroad, are attracted to rent the affordable central London real estate (Lambeth Council, 2016). This young population creates a buzzing night life; however, they also contribute to high rates of crime: especially violent, sex-related, or drug related crimes (Lambeth Council, 2016; “Living in the London Borough of Lambeth,” 2019). Due to the vast majority of the homes and flats in Lambeth being rentals, the population has a high turnover rate of 12%; in other words, only 88% of the population remains the same year-to-year (Lambeth Council, 2016).

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Lambeth also contains many areas where people congregate, as shown in Figure 2-1. This includes large tourist attractions like the London Eye, the UK's most popular paid tourist attraction, and Southbank Center, Europe's largest art center. It also includes transportation hubs like Waterloo Station, the busiest tube station in the UK, used by over 250,000 people daily ("Video Tour of Lambeth in London," 2015). This contributes to a substantial amount of foot traffic and movement through the area.

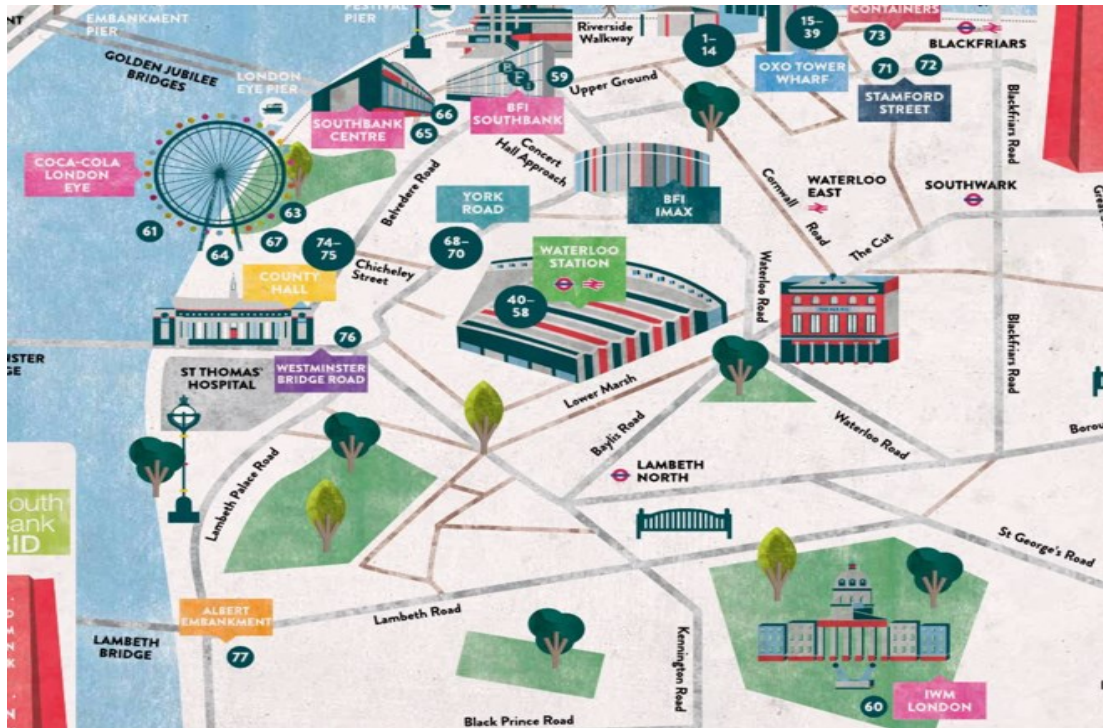


Figure 2-1: Lambeth Attractions

2.2.1 Littering Hot Spots

There are two main types of improperly disposed of trash found in Lambeth with very different hot spots (locations with a large amount of trash): litter and fly-tipping. Littering is defined by Lambeth Council as anything deposited on the streets including cigarette butts, dog fouling, urine, spit, and more (A. Brandon, A. Skilton, & G. Brown, phone interview, November 13, 2019). Fly-tipping is defined as the deposit of larger waste, like full trash bags, cardboard boxes, and furniture ("Fly-tipping: What you wanted to know," 2017).

The hot spots for litter are areas with heavy foot traffic, which in Lambeth are located around the main travel hubs to the north (A. Brandon, A. Skilton, & G. Brown, phone interview, November 13, 2019). This includes busy train stations like Waterloo Station, in addition to tube stations like Brixton Station and Vauxhall Station. It also includes popular walking paths like the Queens Walk on Southbank between Lambeth Bridge and Tower Bridge. This scenic path follows the River Thames and is widely used by tourists traveling to popular attractions like the London Eye, Royal Festival Hall, and the London Aquarium, which combine for over 30 million

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annual visitors (“Video Tour of Lambeth in London,” 2015; Southbank Centre, 2018; “Sea Life London Aquarium,” 2019).

On the other hand, hot spots for fly-tipping are in the more residential areas in the southern portion of Lambeth. In Figure 2-2, each yellow pin represents a single case of fly-tipping and there is a large concentration of pins in southern wards such as Gipsy Hill and Knight’s Hill, highlighted in red and green, respectively (“Lambeth Borough Council- Summary Reports”, n.d.).

2.2.2 Addressing Littering in Lambeth

Littering is illegal in all of the United Kingdom based on Section 87 of The Environmental Protection Act of 1990.

Anyone who deposits litter in any way including throwing, dropping, or flicking, is guilty of committing a criminal offense. The most common method to address Section 87 criminal offenses in Lambeth is to issue the transgressor a Fixed Penalty Notice (FPN)

which is a fine that bypasses a court trial (“Environmental Protection Act,” 1990; Lambeth Council, 2019). Officers responsible for issuing FPNs are called environmental enforcement officers. These officers are contracted by the Council and work for a company called APCOA (APCOA Parking, 2016). Recently, Lambeth decided to increase fines from £50 for dog fouling and £80 for littering to £100 and £150, respectively (Witton, 2019). This strategy is due to the increasing cost of cleaning up litter, as high as £7 million for this past year, and to deter more people from littering. People cited for littering have 14 days to pay their fines and are incentivized to pay within 10 days for a £50 reduction in cost (Lambeth Council, 2019). Failure to pay within 14 days without a valid explanation results in the start of legal processes. Once a case is referred for prosecution at the magistrate’s court, the fine for littering can increase to £2,500 if found guilty (Calvert, 2018). The increase in fines have not shown a noticeable decrease in the amount of littering which has led Lambeth to look for new and innovative solutions (A. Brandon, A. Skilton, & G. Brown, phone interview, November 13, 2019).

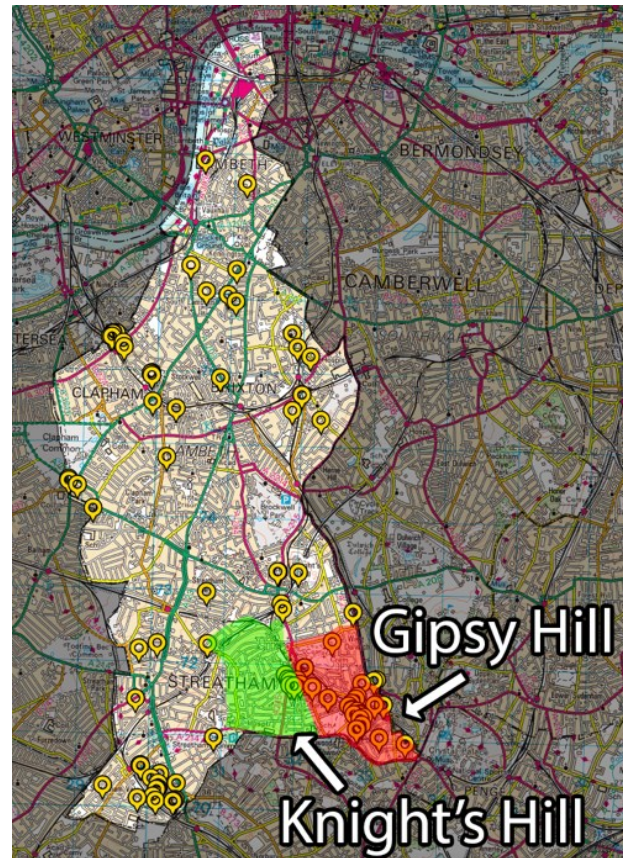


Figure 2-2: Reported Cases of Fly-Tipping in Lambeth

2.3 Psychology of Littering & Behavior-Change

Littering is a classic example of the commons dilemma, also known as the tragedy of the commons. In this dilemma, people can choose to maintain a shared, public resource at a small cost to themselves or exploit it at a small cost to society. The challenge of this dilemma is that

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exploitation seems free because few understand the compounding effect of their actions. (Kolodko et al., 2016). To approach a commons dilemma, people have used classic techniques such as property ownership. Since it is not feasible to privatize all public land where littering occurs, behavior-change campaigns are a viable alternative.

2.3.1 Psychological Approaches for Littering

Psychological approaches to change behavior typically fall into two categories: attitude-change and motivation-change approaches. Attitude-change approaches target people's opinions, whereas motivation-change approaches target what motivates decisions (Miller & Prentice, 2013). In motivation-change approaches, psychologists believe that people already know what behavior they should be exhibiting but fall short due to lack of motivation. According to Campbell (2007), 87% of people in the United Kingdom would be embarrassed if someone caught them littering. This suggests that most people are already aware that they should not be littering, even if they do not fully understand why, which leaves little room for improvement by way of attitude-change approaches (Brook Lyndhurst, 2013). The primary challenge, then, is to motivate people who do not care enough to properly dispose of trash, rather than convince them that they should not litter.

Kurt Lewin describes an individual's behavior as the equilibrium between two opposing "forces" called approach motivation and avoidance motivation. Approach motivation nudges people towards their behavioral goal, and avoidance motivation pushes people away (Miller & Prentice, 2013). Understanding which forces shape littering behavior and the balance between them helps inform an approach that targets the motivations that influence littering.

2.3.2 Environmental Motivations

Studies have shown that littering behavior is partially motivated (15%) by the environmental context that people are in, with the remaining 85% being determined by personal factors such as age, gender, attitudes, and other individual motivations (Schultz, Bator, Large, Bruni & Tabanico, 2013). Specifically, people tend to litter more when their environment is already littered (Torgler, García-Valiñas, & Macintyre, 2012; Lewis et al., 2009). In a study where participants were given a flier on the windscreens of their cars (Figure 2-3), they littered the flier the most when they observed someone littering in an already dirty environment (54% littered), and they littered the least when they observed someone littering in a clean environment (6% littered). In a clean environment, seeing someone litter was repulsive, making people want to litter less than they would have if the person had not littered. In a dirty environment, on the other hand, seeing someone litter sent a message that littering was tolerable and commonplace (Cialdini, 2003).

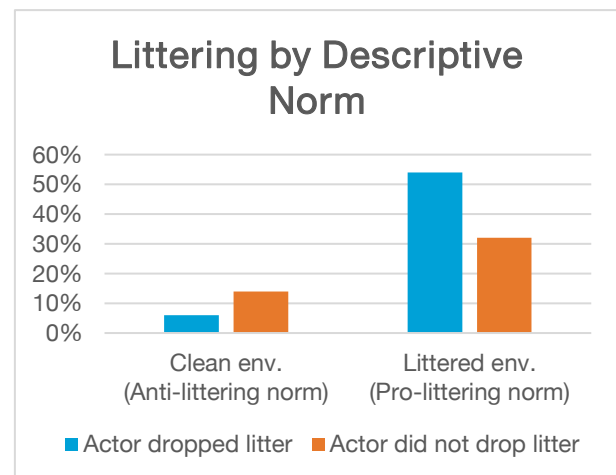


Figure 2-3: Effect of Descriptive Norms on Littering

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Other environmental factors are also correlated with littering. For each added trash bin in a site with at least one receptacle, the littering rate drops by one percentage point from a baseline rate of 17%. For each foot of distance between a person and the nearest bin, their likelihood of littering increases by 0.7%. For cigarette litter, every added ashtray decreased cigarette butt littering by 9% (Schultz et al., 2016). Purposefully modifying people's environments, even with small changes, can "nudge" the public into littering less and can help form anti-littering habits (Kolodko et al., 2016).

2.3.3 Identity Motivations

Cultural values, group norms, and identity are factors in people's decision to litter. An anti-littering campaign in Texas demonstrated that appealing to local pride through the slogan "Don't mess with Texas" was a powerful motivator that reduced littering by 72% over 4 years (Miller & Prentice, 2013). Group identity also plays a role in why teenagers and young adults litter more frequently. To young people, littering is an act of nonconformity, which gives rise to a group identity that young people may adopt. This identity is formed through separating themselves from authority figures, who are in this case the dissociative out-group, which is defined as "social groups with which a person wants to avoid being associated with" (Kolodko et al., 2016; White, Simpson & Argo 2014). Additionally, people tend to avoid behavior that is associated with groups in opposition to their own. In "Don't mess with Texas", painting people who litter as enemies of Texan values makes littering a behavior of a dissociative out-group and motivates people who identify as Texan to avoid littering. It is important to understand and account for group identities in behavior-change campaigns since they can be a powerful motivator (White et al., 2014).



Figure 2-4: Don't Mess with Texas Campaign Sticker

2.3.4 Economic Motivations

Economic incentives and penalties are widely used tools for motivating people in behavior-change campaigns and legislation. Lambeth, and many other places, penalize littering with fines to motivate people to throw their trash out properly (Lambeth Council, 2019). In many cases, economic motivators align with psychological motivators and strengthen behavior-change campaigns, but in some cases, the combination can have counterintuitive and possibly destructive effects. This can be seen in a case study where a daycare pilot-tested a small penalty for parents who picked up children late, and the number of late pickups increased, then stayed higher even after the penalty was removed (Miller & Prentice, 2013). Penalties can create a

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behavioral licensing effect by removing one's moral culpability and replacing the moral costs with an economic one. When applied to littering (such as in Figure 2-5), a similar logic appears: it is important to make sure that fines are sufficiently large enough to send a signal that littering is rare and unacceptable, rather than commonplace and inconsequential (Kolodko et al., 2016). Although many campaigns have successfully used economic motivators, it is important to consider how an underpowered penalty might undercut positive psychological motivators within a campaign.

2.3.5 Motivational Approaches for Behavior-Change

With littering behavior determined by environmental, identity, and economic motivators, anti-littering campaigners and legislators are equipped with several levers that they can use to make positive behavior changes. Even though an individual's environmental context makes up only 15% of their motivation to litter, addressing it is still important since small differences can open avenues for large social changes (Schultz et al., 2013; Kolodko et al., 2016). To utilize these motivations, it is important to keep local environments clean and to make trash bins visible, attractive, nearby, and accessible (Cialdini, 2003; Kolodko et al., 2016). Additionally, using messaging that advertises littering injunctive norms (moral social norms), and descriptive norms (observed social norms) that are aligned is another powerful way to motivate change (Cialdini, 2003). Accompanying an anti-littering message with imagery showing a clean environment and people using litter bins takes advantage of people's tendencies to follow both norms. By making proper disposal more appealing, these messages can overcome negative social stigmas, pushing groups with higher littering tendencies (like young adults) to litter less frequently. (Cialdini, 2003; Kolodko et al., 2016; Miller & Prentice, 2013). Calculated manipulations of group identities like these can serve as effective psychological nudges for behavior-change campaigns.

A practical example of environmental approaches to reducing litter are shown by two studies which identified written prompts such as "Please be helpful!" promoted littering reduction rates in a cafeteria setting. These messages also encouraged cinema patrons to properly dispose of trash and resulted in a 28.3% litter reduction per person (Torgler et al., 2012). This suggests that areas where anti-littering regulations are perceived to be strong and adhered to are less likely to become littered. This is also supported by a simple campaign implementation by Keep Britain Tidy. Their solution targeted areas identified as having high rates of cigarette litter, like outside train stations, shopping centers, and offices, and created Smoking Zones, designated areas for people to smoke at these locations with



Figure 2-5: Past Lambeth Littering Penalty Advertisement



Figure 2-6: Example of Smoking Zone

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proper signage and disposals, as shown in Figure 2-6. Smoking Zones have reduced cigarette litter by up to 89% in these areas, furthering the aforementioned argument (Keep Britain Tidy, n.d.).

2.4 What Makes a Successful Campaign?

Governments and charities around the world run a variety of anti-littering campaigns with the goal of cleaning up their public spaces. Anti-littering campaigns, whether their focus is education or cleanups, are most effective when they are tailored to a specific location. Analyzing campaigns that were effective in environments similar to Lambeth help inform approaches that could be effective in Lambeth. Examples of these model campaigns are found below.

2.4.1 Examples of Effective Campaigns

The ballot bin campaign is a successful campaign that started in the United Kingdom which decreased the amount of cigarette butt litter. This effort used an innovative ashtray design called a ballot bin (Figure 2-7). These ashtrays ask smokers customizable subjective questions like “What would you prefer to watch?” and allow smokers to cast a vote using their cigarette butt. People are motivated to share their opinion, and as a result, they correctly dispose of their cigarettes. This is backed by the campaign’s 46% reduction of cigarette butt litter (“The Ballot Bin is a Customizable Ashtray,” 2019).

The charity bin campaign was a modification to public trash cans that adds incentives for people to use them like the ballot bin campaign. The campaign monitored certain trash bins and donated money to charities proportional to the amount of trash accumulated in each bin (Figure 2-8). The bins were able to create a 30% litter reduction in the streets, and it was found that 9% more waste was deposited in the charity bins compared to normal trash bins (Bin it for Good, 2019). This shows that incentivizing people to properly dispose of their trash is highly effective at reducing litter.

The litter less campaign is a large-scale education campaign that has been occurring around



Figure 2-7: Ballot Bins



Figure 2-8: Charity Bins

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the world since its inception in 2011 as a joint operation between the Wrigley Company Foundation and the Foundation for Environmental Education (FEE). The goal of this campaign is for students to get involved with their local litter problems both in the classroom and on the street. Schools choose to allow students to use investigative journalism strategies and report their findings through Young Reporters for the Environment (a program ran by FEE which empowers students to spread their environmental stories) or adapt the seven step Eco-School methodology into their curriculum (Madsen, 2019). Students who participate in this program are shown to be more passionate about litter themselves and even encourage others to not litter. Participants have also been shown to drop less litter and recycle/reuse more (FEE, 2017).

The Great British Spring Clean is another example of a successful campaign. Its success over the past few years stems from getting the community involved with cleaning up trash while educating people on the negative effects of litter. The program asked for volunteers for multiple cleanup days at different locations in Britain. It built off of identity motivators through marketing itself as Britain's cleanup program, which targeted people's attachment to Britain and made them feel responsible to participate in the campaign. The material used to advertise the events also educated people on the issue of littering by containing facts and statistics on the negative impacts littering has on Britain. The campaign accumulated over 950,000 bags of litter left on the streets in just under 4 weeks across Britain (Great British Spring Clean, 2019).

Love Essex was a successful campaign that educated the residents of Essex about the negative effects of littering and implemented innovative ways to decrease littering that built upon a lot of the ideas from the previous campaigns. The county advertised on buses, fast-food packages, and posters (Figure 2-9) to showcase the problem of littering, and they planned regular litter cleanups with local business and councils. This helped get people involved as well as gave people real and consistent information on the harms of littering. It was so successful that in the effort's third year, Keep Britain Tidy reported a 41% reduction in litter overall ("How to Recycle and Reduce Your Waste," 2019). The campaign was successful because it got people involved, used innovative techniques, and was widely advertised within the county.



Figure 2-9: Love Essex Poster

2.4.2 Consistent Components Between Effective Campaigns

Campaigns often share common components, which are proven to be successful. Four of the main components shared among our five example campaigns are innovation, community participation, education, and incentives.

Innovation is advantageous for anti-littering campaigns since it inspires original methods that encourage people to not litter. Examples include a new way to discard cigarette butts found

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in the ballot bin campaign, changing fast food wrappers to have anti-littering messages shown in the Love Essex campaign, and modifying trash bins like in the charity bin campaign. All these innovative designs promote trash bin usage which, in turn, reduces the amount of littering (Kolodko et al., 2016).

Community participation is another effective theme of a successful campaign. People are more willing to assist with campaigns when it is stated that their work will positively impact their community (Kolodko et al., 2016). The best example of this is in the Great British Spring Clean where volunteers worked to clean the streets for the majority of a month. Community participation in an anti-litter campaign spreads awareness, grows community interest in the environment, and increases the likelihood of a successful campaign (Kolodko, et al., 2016).

Education is always instrumental to incorporate into campaigns, especially if the end goal is to change people's littering behaviors. As seen in the Love Essex effort, educating people on the negative effects of littering can have a positive impact on their littering behavior, which is seen in the direct reduction of litter by 41% over the first three years. Educational campaigns, like Love Essex, are among the most effective behavior-change approaches and provide a lasting impact on their communities (Lewis et al., 2009).

Incentives are the final theme of a successful campaign. Almost every successful incentive campaign that was examined shows that the chance of someone littering can be decreased with positive reinforcement. A clear example of this concept is the United States bottle deposit system. This program provides a small monetary reward in exchange for people returning their bottles for proper recycling and was able to decrease container littering by around 75% (Lewis et al., 2009). Although this example is not from the United Kingdom, it best shows the impact positive reinforcement can have on littering. On the other hand, positive punishment (the addition of a negative consequence) in the form of fines has been shown to have no significant effect on someone's behavior towards littering and people who have been fined are likely to be fined again (Lewis et al., 2009). Therefore, positive punishment should always be used in conjunction with another method to produce a successful litter reduction campaign.

2.5 Background Summary

Through an examination of the harms, prevalence, motivations, and approaches for reducing littering, the team reached an understanding of what causes littering and what methods can be used to reduce it. The team identified which groups are inclined to litter, which include smokers and young urban males with a lack of community attachment. Additionally, the team found that most litter accumulates in areas of high foot traffic, such as the London Eye, Waterloo Station, the north side of Lambeth in general, as well as during meal times and later in the night (Patel et al., 2013; Lewis et al., 2009; A. Brandon, A. Skilton, & G. Brown, phone interview, November 13, 2019; "Video Tour of Lambeth in London," 2015). Next, the team researched Lambeth's existing approaches to littering, which are FPNs. Through research into the psychology of littering, the team found that a combination of environmental, identity, and economic approaches was shown to be most effective in invoking behavior-change. With these motivators in mind, the team analyzed anti-littering campaigns and learned that the two most

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important parts of any campaigns are innovation and education. Innovative campaigns use creative methods to educate and motivate people to properly dispose of their trash, which leads campaigns to be effective long after they have concluded. These findings have given the team the necessary information and confidence they need to create and implement a successful anti-littering campaign during their time in Lambeth.

3.0 Methodology

The goal of our project is to develop and test an implementable anti-littering strategy that assists Lambeth Council in addressing the problem of excessive littering in their borough. We approached this goal through four main objectives:

- To understand individuals' attitudes toward littering in Lambeth,
- To characterize the littering problem in Lambeth,
- To design, test, and quantify methods of preventing littering, and
- To develop a litter reduction plan for Lambeth.

In order to accomplish these objectives, the team identified a set of tasks to accomplish within a seven-week period in Lambeth from January 20 to March 6, 2020. These tasks are drawn as white boxes within each objective in Figure 3-1. A Gantt chart showing when we planned to complete these tasks is in Appendix A: Project Schedule.

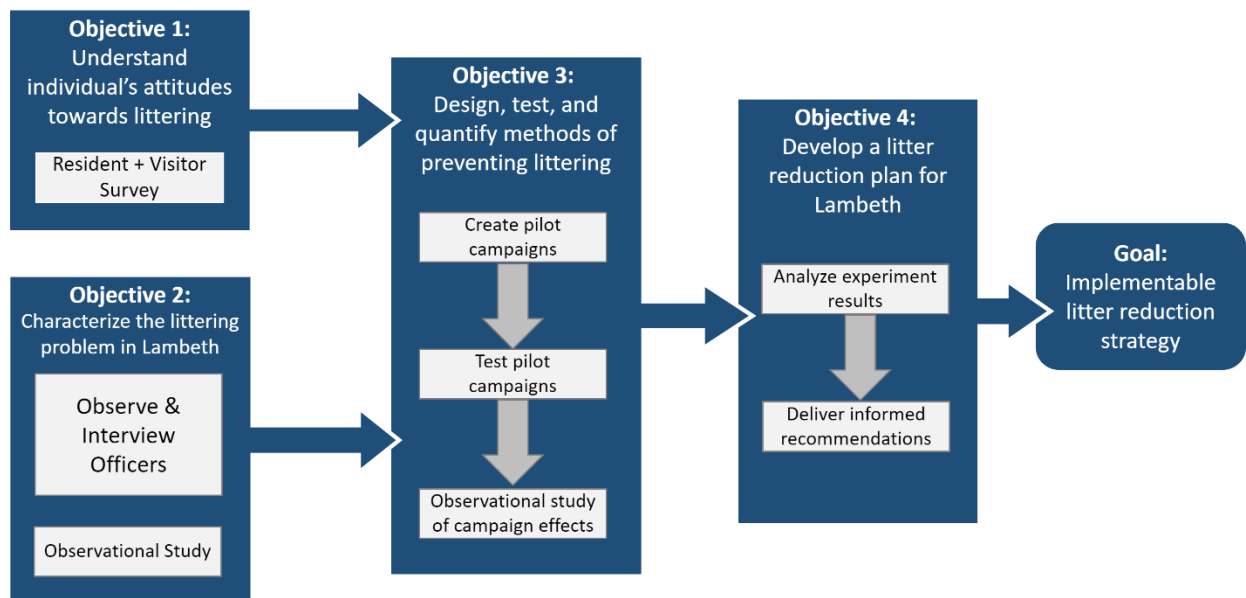


Figure 3-1: Flowchart Showing Objectives and Tasks

As illustrated in this figure, our first two objectives informed our third objective, which informed our final objective. The tasks within each objective that have arrows between them show the order in which we planned to complete them. The team focused its efforts in the central and northern parts of the Borough, where we believed that our street-litter prevention approaches would be most effective and have the largest positive impact. North Lambeth experiences more street litter, especially from cigarettes, food wrappers, and other similar items, than the rest of the Borough as a result of high foot-traffic (A. Brandon, A. Skilton, & G. Brown, phone interview, November 13, 2019). Through these tasks and objectives, the team developed a localized understanding of Lambeth's littering problem that informed strategies for our pilot anti-littering campaigns. Details of our approach and implementation are presented in the following subsections and results are provided in Chapter 4.0.

3.1 Objective 1: To Understand Individuals' Attitudes Toward Littering in Lambeth

The team's first objective was to understand the attitudes of residents and visitors in Lambeth towards littering and to learn about people's opinions on the importance and magnitude of the littering problem. As discussed previously, behavior-change campaigns rely on an understanding of the motivations and attitudes of the target audience. With the information gathered from this objective, the team identified which motivational approaches and campaigns would most effectively change littering behavior in Lambeth. For this objective, the team administered a survey that was distributed to residents and visitors of the Borough, then analyzed the responses to determine people's opinions on FPNs; where, why, and how often they believe littering occurs; what changes people wanted to reduce littering; and how attached they are to the community. The analysis of this survey is presented in Section 4.1: Survey Results and Appendix E: Survey Responses Aggregate Data.

3.1.1 Survey of Residents and Visitors of Lambeth

The team created survey questions in Appendix B: Resident & Visitor Survey Questions to poll people's opinions on littering and littering enforcement. The survey was anonymous, confidential, and completely voluntary with no mandatory questions. The team ensured that the survey was compliant with new European Union General Data Protection Regulations (GDPR) by clearly explaining the survey's purpose, how the data would be used, and that the survey was fully anonymous. It featured primarily subjective questions that use Likert scales and multiple-choice questions, and it provided opportunities for people to elaborate in open-ended responses. The team designed the survey in Qualtrics, an online software tool for creating and distributing surveys, and in Microsoft Word for print. The team did not believe that individuals would want to take the survey more than once, but in the event that someone tried to, the team enabled an option called "Prevent Ballot Stuffing" in Qualtrics to limit electronically-distributed surveys to one response per computer (Survey Protection, 2019).

The survey was given to residents and visitors of the Borough through convenience sampling, which samples the population that is readily accessible. Due to limitations in distribution methods available to us, the team determined that a random sample would be unfeasible. We distributed it via the Council's public Twitter account, through Lamnet (an internal website for Council employees), through an email to Council employees, and through street canvassing. To survey people in public places, the team used printed copies of the surveys on clipboards, which we later entered into Qualtrics for analysis. We surveyed people in high-traffic public places including Underground stations, parks, libraries, plazas, and markets to capture responses from a variety of visitors, residents, and tourists.

3.1.2 Analyzing Resident and Visitor Survey

To analyze our results, we first looked over the responses to determine if there were any blatantly invalid responses, such as people who selected that they have received an FPN for littering, yet they say that they had never littered. We also checked for respondents who marked

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“Other: Please specify” and then wrote something identical or very similar to one of the provided options, in which case we updated their selections to include that option.

Once we removed invalid responses and edited miscategorized selections to make our data consistent, we then exported our responses from Qualtrics since we wanted to be able to explore the data using tools that we were more familiar with and that had more flexibility. We imported the data into a MySQL database using a custom Python program which then allowed us to run various queries on the survey responses. This also allowed us to view if there were trends in how different segments of our sample population answered the same questions. We analyzed our responses in two different groups of segments. First, we compared responses between age groups (which are disjoint classes), then we compared responses between residents, visitors, people employed in Lambeth, people who have admitted to littering, smokers, men, and women (which may have overlapping members). In each comparison, we also included the survey’s overall average to see if any group was a significant outlier. Once we had calculated the average response to each question within these categories, we imported the data into Excel; an example is shown below in Table 3-1, showing the percentages of each age group that selected each option. Since this was a “check all that apply” question, the numbers do not add up to 100%.

Where do you primarily see litter? Check all that apply							
Where	Survey Average	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
On the street or footway	88.06%	75.00%	86.67%	92.86%	81.82%	90.91%	100.00%
In or around public transportation hubs	61.19%	62.50%	40.00%	78.57%	72.73%	63.64%	42.86%
Near schools	20.90%	0.00%	6.67%	42.86%	27.27%	18.18%	28.57%
Private property	14.93%	25.00%	6.67%	14.29%	27.27%	18.18%	0.00%
Near restaurants or businesses	59.70%	25.00%	40.00%	57.14%	63.64%	90.91%	85.71%
Recreational areas	58.21%	62.50%	66.67%	50.00%	72.73%	45.45%	42.86%
Other	4.48%	0.00%	0.00%	7.14%	9.09%	9.09%	0.00%

Table 3-1: Survey Analysis Showing Responses Averaged by Age Group

Analyzing the responses in this survey helped the team understand public perception of the littering problem and gave us insight into the psychological and environmental factors that lead people to litter. The survey also helped us gauge community attachment and group identity, which informed how we developed our campaign in Objective 3. While some of the open-ended responses fell outside of the scope of the project or were otherwise irrelevant, others were useful in brainstorming ideas and generating suggestions, or illuminated misunderstandings or misconceptions that the general public had. The analysis of this survey can be found in Section 4.1: Survey Results and Appendix E: Survey Responses Aggregate Data.

3.2 Objective 2: To Characterize the Littering Problem in Lambeth

The team’s next objective was to understand the specific details of the littering problem within Lambeth so that we could best tailor a campaign towards the area. Through background research, the team identified several successful litter-reduction campaigns, but found that they may only be effective in certain circumstances. Thus, it was crucial to fully understand the dynamics of Lambeth and its littering problem so that the team could determine which approaches would work best there. We achieved this through observing and interviewing

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environmental enforcement officers (EEOs), contracted by Lambeth Council through APCOA, whose job it is to observe littering and enforce anti-littering policies through the distribution of FPNs. The team also observed littering behavior at different locations in the Borough to determine the kinds of litter dropped, when littering is most likely, and where litter accumulates in Lambeth. Finally, the team conducted formal observational studies at three different locations in Lambeth to quantify the rate at which smokers littered cigarette butts.

3.2.1 Observations and Interviews of Environmental Enforcement Officers

Each day, EEOs in Lambeth watch for litterers and issue FPNs to them; therefore, the team believed observing and interviewing these officers would provide valuable firsthand insight into the littering problem in the Borough. Our liaisons from the Highways and Environmental Enforcement Team helped us coordinate meetings with six EEOs who were willing to participate in our observational studies and interviews during our first week in Lambeth.

While observing the officers on the job, our team took note of what types of locations, times of day, and individual behaviors were most likely to lead to littering. The team also conducted a semi-structured interview with these EEOs in order to narrow our campaign's scope based on their responses and experiences. The interview schedule used during these conversations is shown in Appendix C: Environmental Enforcement Officer Interview Schedule. Through a semi-structured interview, the team was able to address major topics of interest for this project while leaving room to further explore specific topics that each officer was most passionate and knowledgeable about. This helped achieve our goal of further understanding the objectives, experiences, and beliefs held by the officers who enforce Lambeth's anti-littering laws. The major topics the team wanted to explore included the main logistics of their job, their experience of litterer demographics in Lambeth, and their opinions on the effectiveness of FPNs. This information allowed us to further determine the efficacy of FPNs, refine our target population and locations, and learn about common types of litter to increase the impact of our anti-littering campaigns in the Borough.

The team then transferred the officers' responses, found in Appendix F: Officer Interview Responses, into a spreadsheet with our observational notes, which we analyzed by coding and categorizing, and can be found in Appendix G: Officer Interview Responses Coded. Through this process, the team could analyze responses to observe trends across the officers' experiences and opinions regarding littering in Lambeth. This data allowed us to refine the focus and targets of our anti-littering campaign to ensure it would be as effective as possible for Lambeth Council.

3.2.2 Observational Study of Littering Throughout the Borough

Another effective way to understand and characterize the littering problem in Lambeth was to observe the litter throughout the Borough for ourselves. This observational study investigated the severity of littering in different wards and specific places of interest within Lambeth, like locations that typically see large amounts of litter (e.g., major transportation hubs and areas of congregation). The team made preliminary observations in these general areas in order to determine for ourselves the types, times, and locations of most littering in the Borough.

We then compared our background research and our preliminary observations with what we witnessed in our preliminary observations and found that cigarette littering was by far the most prevalent form of littering behavior in Lambeth. With these preliminary results, the team decided to narrow the scope of our campaign to focus specifically on cigarette butts and three target locations at which to perform our main observational studies – Brixton Station, Vauxhall Station, and Waterloo Station, as depicted in the map in Figure 3-2. These locations are all immediately outside heavily trafficked Underground stations that also have National Rail services and bus stations nearby, and where officers frequently cite FPNs for littering cigarette butts.

The team then finalized the method for quantifying cigarette litter in congested areas. Our strategy was to section off a very specific area of the pavement outside these Underground stations that included two or three litter bins and split our group into two pairs, one on each end of this region. An example of the kind of area we sectioned off can be seen in Figure 3-3, showing our study area outside of Brixton Station. One team member was responsible for counting the number of proper and improper cigarette butt disposals at trash bins and ashtrays (Observer 1 in Figure 3-3), while the other three would inconspicuously observe smokers in the area and tally the number of cigarette butts that were littered (Observer 2-4 in Figure 3-3). The team frequently compared tallies to make sure nothing was missed nor double counted. We divided cigarette disposal into three distinct categories: proper disposal (those that were extinguished and disposed of in the rubbish bins or ashtrays correctly), improper disposal (those that were extinguished and left outside or atop the bin as well as those thrown directly into the bin before being extinguished), and litter (those thrown directly onto the ground or into the drains and gutters).



Figure 3-2: Observational Study Locations

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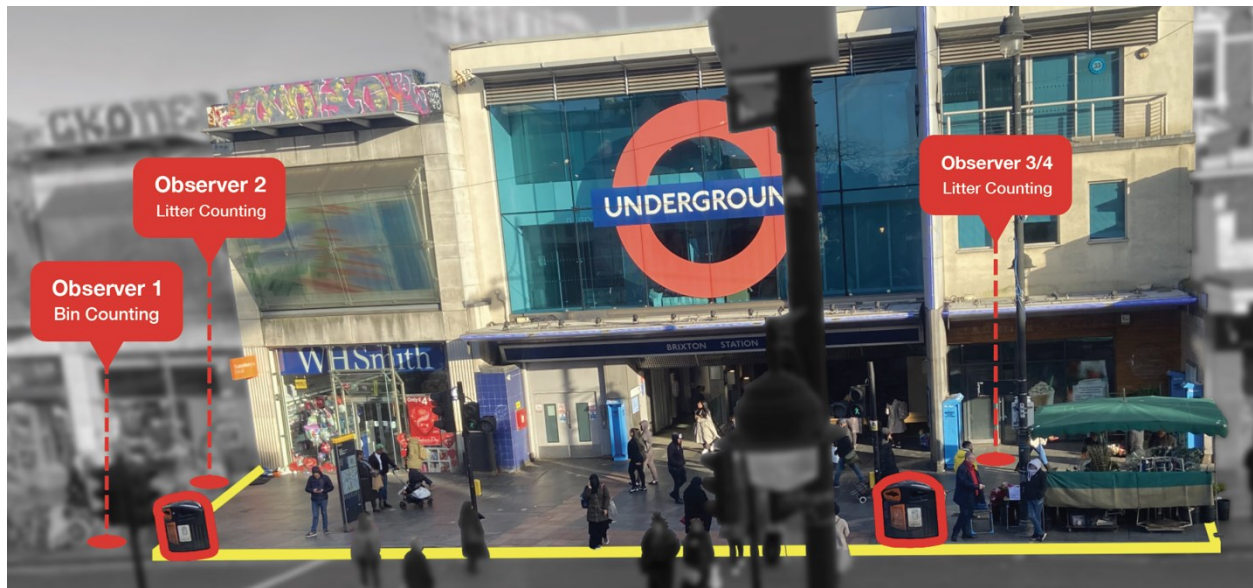


Figure 3-3: Brixton Station Observation Area

We assigned one day of the week to each of our three locations, and on these days, we observed cigarette disposal behavior for exactly one hour during the morning commute (approximately 7:00-10:00), and one more hour during the lunch rush (approximately 11:00-13:30). Our results for proper disposals, improper disposals, and littering events were then recorded so that we could calculate the ratio of cigarette litter to proper disposal and compare across locations and times of day. This data can be seen in Appendix H: Baseline Litter Counts. These observations served as our baseline statistics of cigarette litter in Lambeth so that we could study the same locations using the same methods, times, and days of week after implementing our campaign in order to determine its effectiveness.

3.3 Objective 3: To Design, Test, and Quantify Methods of Preventing Littering

The team concluded, based on the information gathered in Objectives 1 and 2 and analysis conducted during Findings Section 4.1 and 4.2, that an advertising campaign would work best for changing people's behaviors in Lambeth; therefore, in this objective we designed and tested an advertisement pilot campaign with posters as our medium. After implementing our pilot campaign, the team used the same observational study protocol from Objective 2 to quantify the campaign's successfulness in order to deliver informed and tested recommendations in Objective 4.

3.3.1 Pilot Campaign Poster Design

Based on our findings summarized in Section 4.3 and our research into what makes an effective campaign, the team decided that an educational advertisement campaign would have the greatest likelihood of reducing littering in the area. The team used Adobe Illustrator and Photoshop to make the posters for our campaign, which gave us the freedom and flexibility to create custom designs.

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From our survey responses (which are presented in Section 4.1), we deduced that the residents of Lambeth have a sense of community attachment. Through our research into effective campaigns, we learned this sense of community attachment could be targeted to incentivize individuals to participate in our campaign by littering less to keep their environment clean. To accomplish this in our campaign, we used specific wording such as “our” in “Cigarette ends pollute our landmarks” and very recognizable locations within Lambeth as shown in Figure 3-4. To keep landmarks relevant to viewers all over Lambeth, we made different posters for each observational study location with nearby sights. Through our psychology research, we learned that showing clean locations in posters was more effective at decreasing littering than dirty ones; therefore, we brightened up photos that had no visible litter in them to make the areas seem cleaner. To keep our campaign consistent with other litter reduction efforts around London and the United Kingdom, we added in the International Tidy Man as it is a recognizable symbol of people’s efforts around the world to decrease litter.



Figure 3-4: Poster for Waterloo Station



Figure 3-5: Bin Topper Design

littering policy to further educate them, and Lambeth Council’s logo which legitimizes our campaign.

The last piece for our design was drawn from our preliminary observations, where we observed numerous people stubbing out their cigarettes and then improperly disposing of them by leaving them on top of the bins. To combat this, the team created the slogan “Ash it and Trash it” which was memorable, easy to understand, and succinct like the “Don’t Mess with Texas”

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campaign; although, unlike Texas's campaign slogan, our slogan incorporated the education component of effective campaigns by teaching people how to properly dispose of their cigarette butts. Since this was such a significant issue, we decided to add additional, clear instructions that could be seen by the user. To accomplish this, we designed an innovative sticker for the top of litter bins which can be seen in Figure 3-5.

The design of this research-backed pilot campaign incorporated three components of successful campaigns: innovation, community attachment, and education. Incorporating these elements gave our advertisements the best chance of reducing cigarette litter in the area while keeping the costs low for the Council. The complete set of poster designs can be seen in Appendix D: Poster Designs & Bin Topper.

Once the design was completed, we needed to decide the best method to adhere these to the trash cans we would be observing. We decided to use A3 because it is a standard paper size which is easy to print, large enough to notice, and comfortably fits on all the different types of bins we were working with. In order to adhere these to the trash cans, we decided to print the Waterloo and Vauxhall Station posters on vinyl cling so that they could be easily attached to the bins, as seen in Figure 3-6, and eventually be detached. For the bins at Brixton Station, we decided to use gaffer tape to fasten our posters to the litter bins as we did not believe that the vinyl cling would adhere to the bins' irregular surfaces.



Figure 3-6: Posters Attached with Vinyl Cling at Vauxhall Station

3.3.2 Quantify Success of Campaign Ideas Through Observational Studies

While running the campaign, the team conducted observational studies to observe its effectiveness in decreasing people's tendency to litter. The team conducted experiments in the same locations and with the same protocol that was used in our observational studies in Objective 2 so that we could use the data gained from those studies as a baseline to compare our campaign against. This information allowed the team to quantify the change in amount of litter after our campaign and determine its effectiveness using methods described in Section 3.4.1: Analyze the Results of the Campaign, and analysis conducted in Section 4.4: Campaign Effectiveness.

3.4 Objective 4: To Develop a Litter Reduction Plan for Lambeth

Once the team completed our first three objectives, we developed a litter reduction plan for Lambeth. Using data collected during our observational studies, we analyzed how effective the pilot campaign was based on the percentage of cigarettes that were correctly disposed of. Then, we used our research and data to recommend a littering reduction plan to Lambeth Council.

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3.4.1 Analyze the Results of the Campaign

Once the team conducted our poster pilot campaign and concluded our observational studies, we were able to input our data and analyze our results and determine the campaign's effectiveness. To start, we entered our baseline observational study data, conducted during Objective 2, into an Excel spreadsheet (See example below in Table 3-2).

Brixton Tube Station Tuesday January 28, 2019 11:52 - 12:52			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	23	74.19%	54.76%
Bin Interaction with Improper Disposal	8	25.81%	19.05%
Total Litter Bin Interactions	31	100.00%	73.81%
Improper Disposal (Cigarettes Littered on Ground)	11	57.89%	26.19%
Improper Disposal (Cigarette Ashed and Left on Bin)	8	42.11%	19.05%
Total Improperly Disposed of Cigarettes	19	100.00%	45.24%
Total Cigarettes Counted	42	100.00%	100.00%

Table 3-2: Brixton Baseline Observation Results

We organized our data so we could specifically see how many cigarette disposals involved an interaction with the litter bin, and of those interactions, the percent of cigarettes that were properly disposed of. This enabled us to determine the percentage of improper disposals that were stubbed out and not put into the bin versus the percent that were tossed, flicked, or dropped on the pavement. The team focused on the percent of total cigarettes counted that were properly disposed of and the percent of those that were improperly disposed of. In Table 3-2, these percentages are in green and red, respectively. In this example, they tell a story where only 55% of cigarettes counted were both stubbed out and thrown away properly, and the other 45% were either stubbed out and left on the bin, or just thrown on the ground. After our baseline observation results were recorded, we created a matching Excel spreadsheet with the second round of observations from Objective 3. Looking at the same percentages, we determined if proper ashtray usage increased or decreased; however, not all changes are significant. To determine how significant our results were and if our campaign results were repeatable, the team conducted a paired t-test to determine a proper t-value. Based on our calculated t-value and our one tailed hypothesis, meaning our only goal was to decrease the amount of cigarette litter, we were able to calculate a p-value with five degrees of freedom. This p-value allowed for us to determine the overall statistical significance of our campaign and the likelihood that our results could be caused by random chance. We determined that if there was less than a 5% probability that our results were caused by chance ($p < .05$) then we would accept our hypothesis and our campaign would be effective and statistically significant. This analysis is presented in Section 4.3.

3.4.2 Recommendations for Continuing Our Work

Finally, we left a series of recommendations for Lambeth Council to aid them in reducing litter in their Borough. Our recommendations were pulled from our personal experiences in the borough; the results of our campaign, surveys, and interviews; and our research into psychology and effective litter reduction campaigns in the past. Personal experience recommendations came from a combination of what we specifically observed in Lambeth and what we noticed other central London boroughs doing to combat littering. Recommendations from our firsthand research were based on the effectiveness of our own campaign and concerns that came up during our analysis of interviews and surveys. Recommendations based on our research came largely from research into effective campaigns, since many of these campaigns have already proven effective and we believe that they will work in Lambeth.

4.0 Findings & Discussion

In this chapter, we show and discuss key findings from the data we gathered through our survey, officer interviews, and observational studies. The data, our analysis, and discussion informed our recommendations in Chapter 5.

4.1 Survey Results

Our survey of residents and visitors to Lambeth garnered 80 valid responses. These responses came from street canvassing, followers of Lambeth's Twitter, Lamnet, and an email to Council employees, shown in Figure 4-1. Our survey attracted responses from residents, visitors, and people employed in Lambeth of all ages (over 18) and also included both smokers and non-smokers. A complete set of statistics from our analysis of the survey data is Appendix E: Survey Responses Aggregate Data.

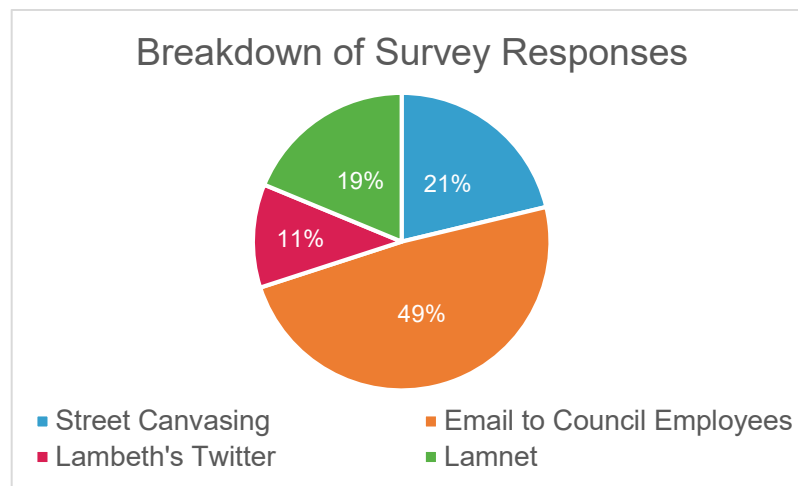


Figure 4-1: Survey Response Origin Breakdown

4.1.1 Littering: Why, How Often, and Where?

On average, people strongly believed ($\geq 4.8/5$) that littering was unacceptable and important to address, and that they would feel guilty if they were caught littering. This matches what we found in our research and reaffirms our motivational approach to behavior-change. Respondents slightly agreed ($3.5/5$) with the idea that people litter because of a lack of education about littering.

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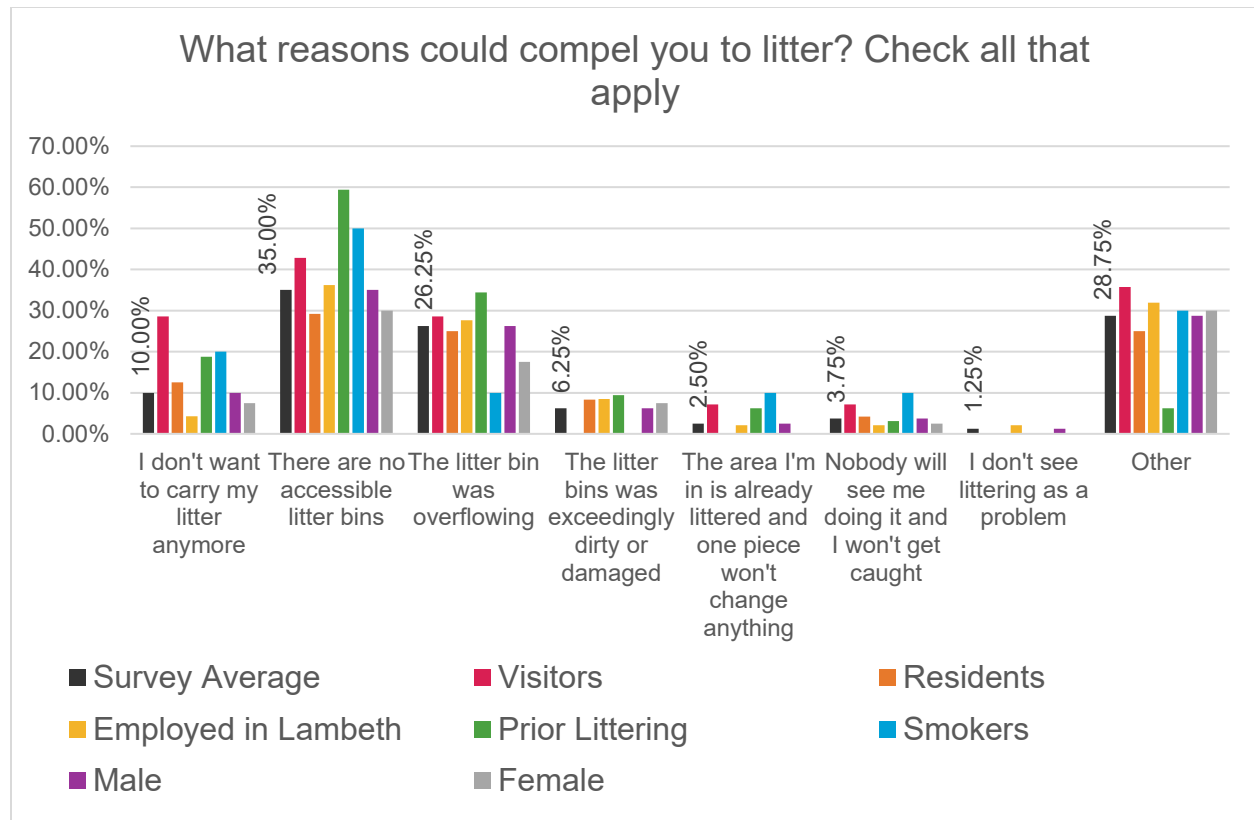


Figure 4-2: Stated Reasons for Littering

Figure 4-2 shows how frequently different segments of our sample selected each option for the question, “What reasons could compel you to litter?”, and the overall average of our entire sample. People most frequently (35%) selected that there were no accessible litter bins. Notably within this figure, of people who admitted to littering, 59% stated that they littered because there was no nearby litter bin, and 34% of them stated that they littered because the bin was full or overflowing. Most of the people who selected “Other: please specify” for this question wrote that they would never litter; others mentioned they may litter a biodegradable or natural item (like fruit peels, apple cores, or even urine) in areas that were not built-up or were far away from cities.

Overall, people seemed to blame their own littering behavior much more on their environment and much less on themselves. This is illustrated by the large difference between how often the choice “I don’t want to carry my litter anymore” and the choice “There are no accessible litter bins” were selected. Logically, anyone who littered because there was not a nearby litter bin did so because they did not want to carry their litter anymore, but 25% fewer people selected this option. This difference highlights the cognitive dissonance in how people saw littering, where most people believed that littering was a serious issue and important to address, but if they littered it was not their fault. This insight motivated the team to use community attachment in our poster design and recommendations to help make the issue of littering feel more personal to our target audience.

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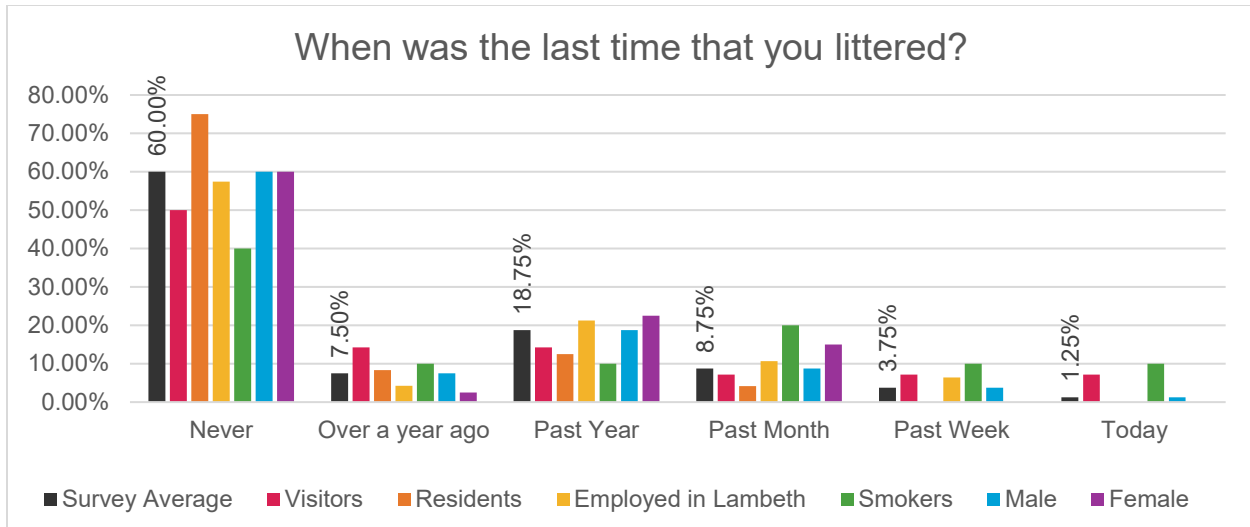


Figure 4-3: Frequency of Littering

Figure 4-3 shows how recently selected segments of our sample population admitted to littering. Most people (60%) stated that they had never littered. If they admitted to littering, it was most likely that they claimed to have not littered recently, with only one third of people admitting that they had littered sometime within the past year. This information supports the conclusion that most people do not frequently litter.

These results suggest that littering is often opportunistic rather than habitual. Our research (Section 2.3.2) shows that making small environmental changes can nudge people away from making these opportunistic littering decisions, and our team believed these nudging techniques (like posters or advertisements) would be effective in Lambeth.

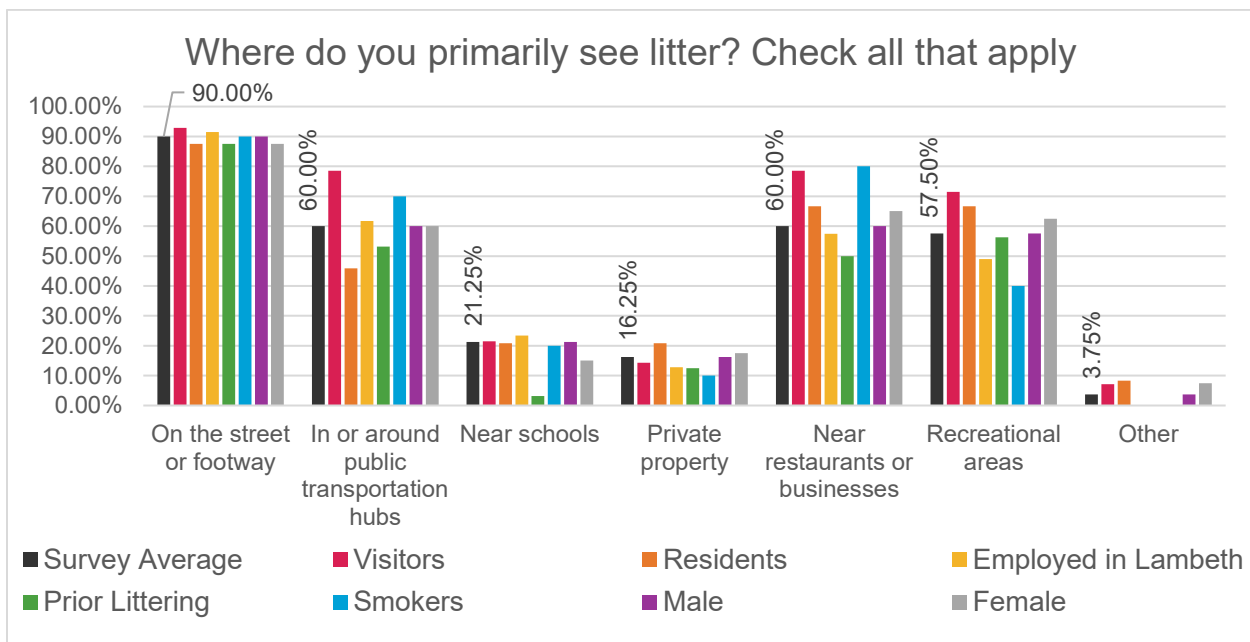


Figure 4-4: Where People See Litter

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Figure 4-4 shows where segments of our sample population saw litter in the Borough. Almost all respondents (90%) selected that they see litter on streets and footways. Most of them also selected that they saw litter around public transportation (60%), near restaurants or businesses (60%), and in recreational areas (58%). Most people did not say that they primarily saw litter near schools or on private property. This information corroborates conclusions from our research that littering primarily happens in highly trafficked areas and informs us that littering at schools and private property are not the highest priority locations to target to reduce littering in Lambeth.

4.1.2 Popular Ideas for Change

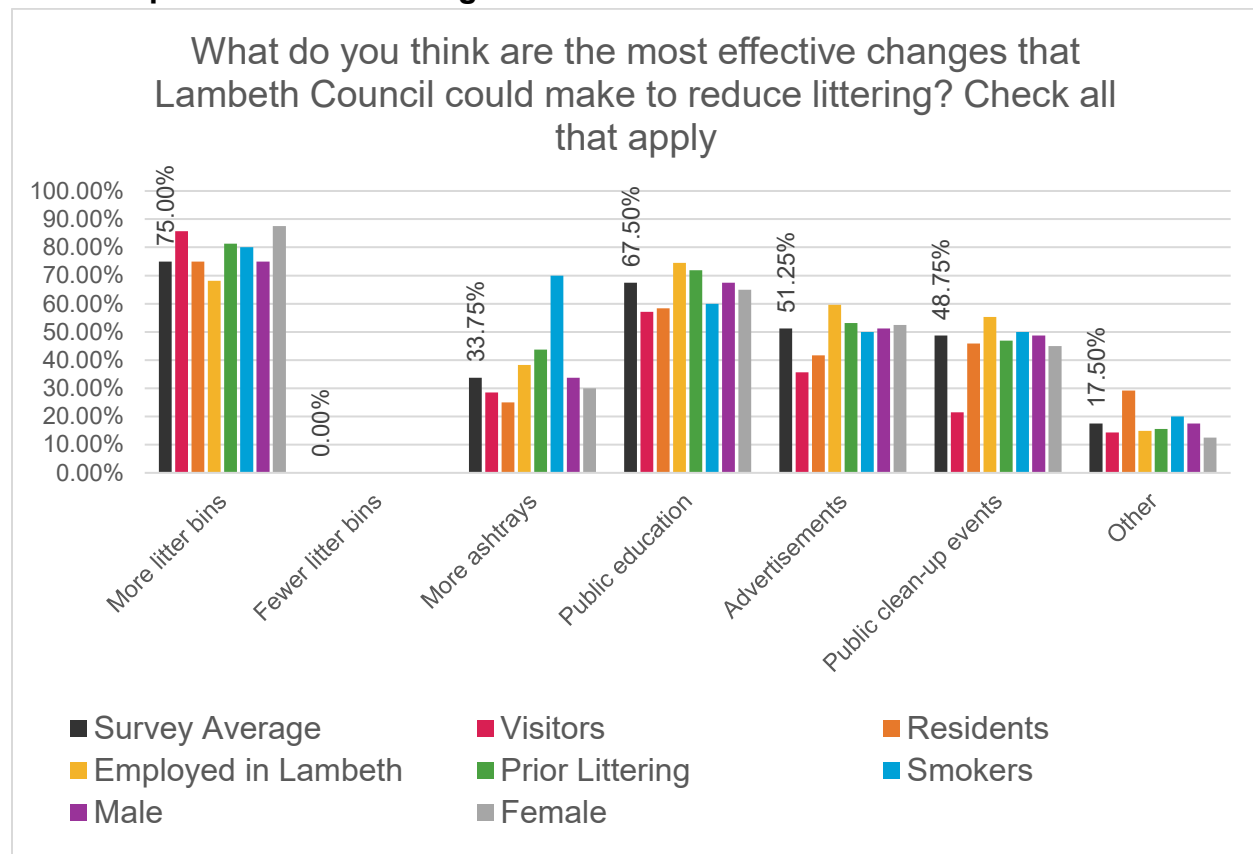


Figure 4-5: What People Want the Council to Do About Littering

To understand what people thought the Council could improve upon to reduce littering, we asked them the question, “What do you think are the most effective changes that Lambeth Council could make to reduce littering?”. The rates at which different segments of our sample population selected each choice are shown in Figure 4-5, and the overall survey average for each choice is displayed for comparison. People frequently chose adding litter bins (75%) as an effective method, and nobody said that removing litter bins would reduce littering. Smokers chose adding ashtrays 41% more often than non-smokers ($p < 0.01$)* and selected this option

* When comparing two averages, a p-value (often denoted as $p < X$) is a way to quantify the statistical

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almost as frequently as they picked adding litter bins. Approximately half of people surveyed said they think that advertisements would be effective, and just under half said that public cleanup events would reduce litter. Some of the common “Other” responses people wrote were that they wanted better or stronger enforcement or cleaning services and that a change in culture was needed to make people see littering as negative.

With over two-thirds (68%) of the sample suggesting public education as a positive change the Council could make and, on average, only a modest agreement (3.5/5) to the statement, “People litter because of a lack of education about littering,” we concluded that people feel that there needs to be more effective littering education, not just a larger quantity of it. With these suggestions from the public, we determined that instructional messages in anti-littering advertisements would be an effective way to educate the public about littering. Even though adding more litter bins was the most popular option, we were unable to test how effective this modification would be due to restrictions in budget, time, and resources.

4.1.3 Public Perception of FPNs

Next, we examined public opinions on Fixed Penalty Notices, and how they might suggest FPN policy could be changed. The demographic breakdown of responses to these questions is shown in Figure 4-6 and Figure 4-7, below:

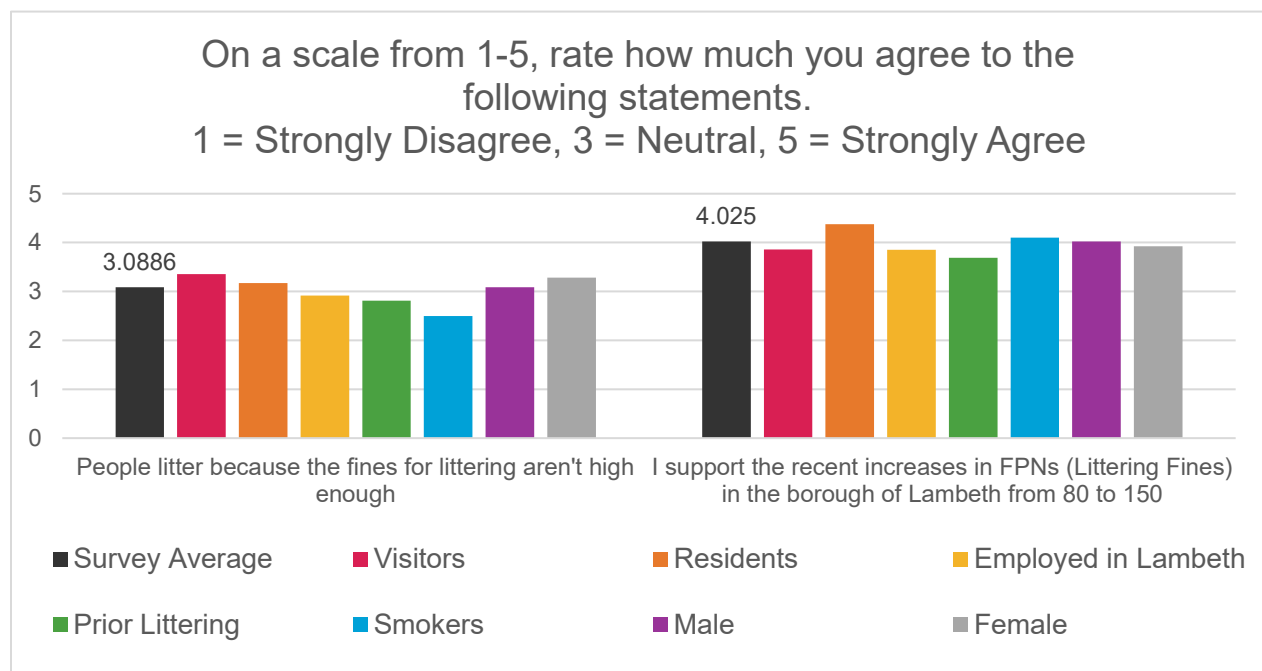


Figure 4-6: Opinions on FPN Amount

significance of the comparison. A lower p-value is more significant, and conventionally $p < 0.05$ is considered statistically significant. Higher p-values do not mean that the comparison is insignificant necessarily, but it suggests that there is a higher chance the difference was caused by random chance in sampling.

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People who had admitted to littering before slightly disagreed (2.8/5) with the idea that fines being too low is a reason that people litter, yet they typically support (3.7/5) the recent increase in FPN amounts in Lambeth. This combination of responses indicated to us that our initial research and hypotheses were correct in assuming two things: fines alone are not enough to dissuade people's littering behavior and most people already know that littering is wrong, which makes them supportive of changes that aim to combat this behavior.

We also saw that most people believe larger fines would be a more effective change than smaller fines, yet overall people did not feel that either change would be an effective littering reduction method in Lambeth at all. This data helped inform some of our conclusions that Lambeth's recent FPN increase was a good decision, yet we also determined that we would not recommend further increases. Instead, using this and our previous data analysis, we decided to advertise the higher FPN amounts on our posters to inform the public and dissuade people from littering.

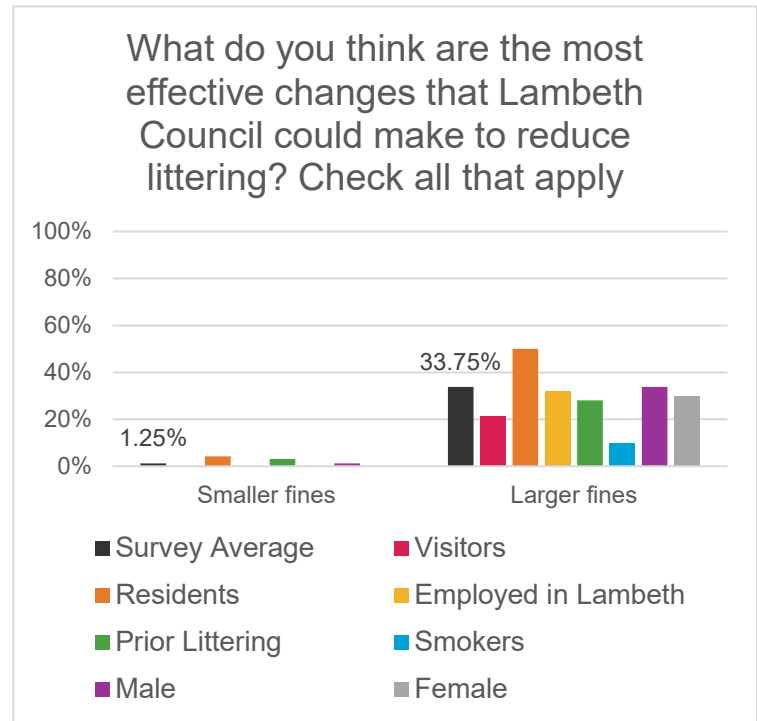


Figure 4-7: Opinions on Raising FPNs

4.1.4 Community Attachment & Engagement

One of the other main objectives of our survey was to understand and measure

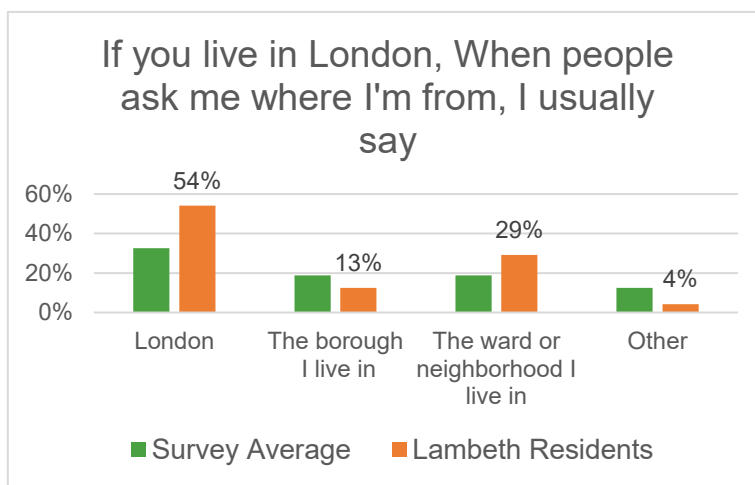


Figure 4-8: Regional Identities

community identities, attachment, and engagement to determine if there is a strong sense of community spirit in Lambeth that could be targeted in our pilot or future campaigns. To understand regional identity, we asked people where they said they were from, as shown in Figure 4-8. More of our respondents who live within Lambeth identified as Londoners (54%) rather than identifying with their ward or borough (42% combined), which

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implies that many members of our target population do not strongly identify with Lambeth. This information informed the team's conclusion to not specifically target attachment to Lambeth or any of its wards within our litter reduction campaigns. Additionally, since many people who litter in Lambeth do not live in Lambeth, advertisements or campaigns that wish to apply to everyone who litters within the Borough should only rely on features of Lambeth that are externally well-known, like the London Eye. More information on our recommendations for future advertising campaigns can be found in Section 5.1: Future Anti-Littering Advertisement Campaigns.

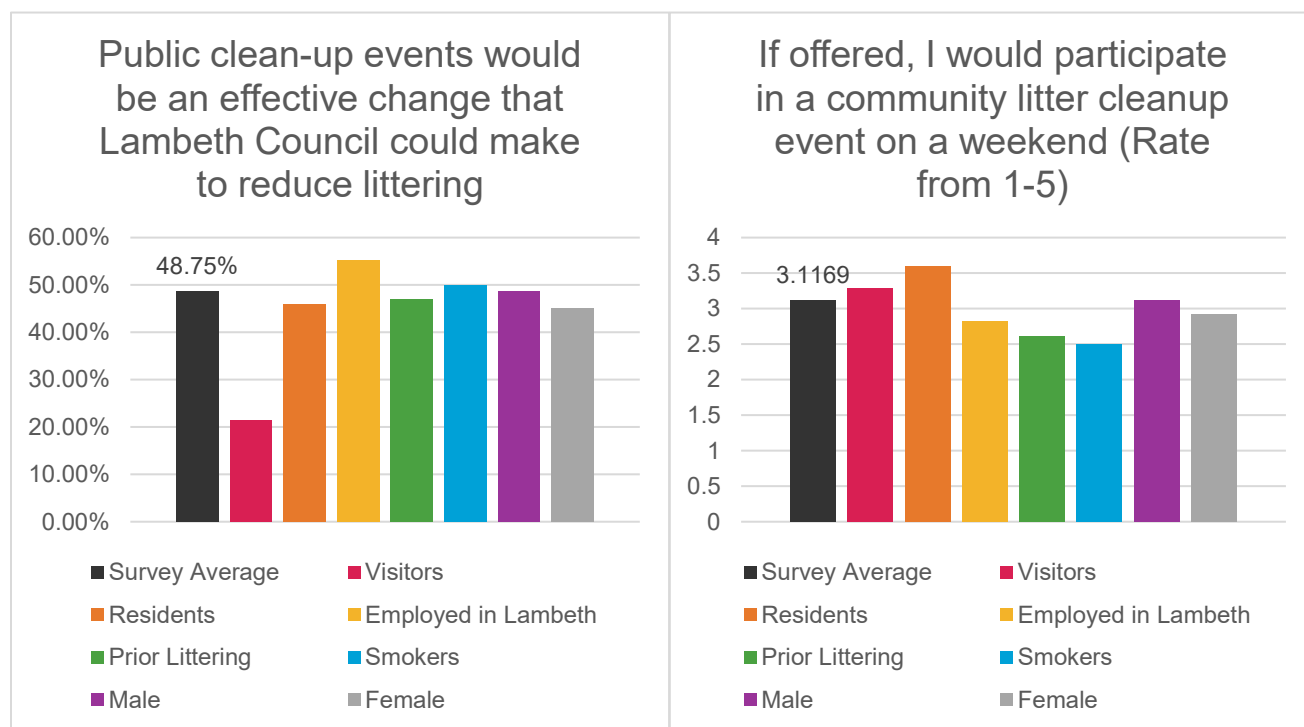


Figure 4-9: Public Perception of Community Cleanups

To measure community attachment and engagement, we proposed the idea of a community litter cleanup event. We asked if people would voluntarily participate in a future cleanup event and if they thought it would help the littering problem (results shown in Figure 4-10). We found that most people had conflicting opinions towards the idea of participating in a community cleanup event, with as many people strongly agreeing that they would participate as strongly disagreeing, on average. Similarly, about half of the respondents said public cleanup events would be an effective change that would reduce littering. From these results, we believe that there is a good chance that some people would volunteer their time to a litter cleanup campaign in their area, suggesting that there is some community engagement and attachment in Lambeth. Public cleanup events can reduce future littering because they give people a sense of ownership in public land and because cleaner areas compel people to litter less frequently. Our recommendation for public cleanups can be found in Section 5.4.

4.2 Results of Environmental Enforcement Officer Interviews and Observations

This section discusses the trends we found through analyzing officer responses to our semi-structured interview, outlined in Section 3.2.1. It also draws conclusions from our own observations of the officers. The following sections report on the trends we analyzed that were relevant to the scope of our project. The complete set of notes taken on each officer's responses can be found in Appendix F: Officer Interview Responses, and a table containing the coded and categorized responses used for analysis can be found in Appendix G: Officer Interview Responses Coded.

4.2.1 Observed Littering Trends

The interviews began with a few simple questions in order to establish a rapport between the officers and us, and to learn some basic information about their positions. We asked the officers if they noticed any spatial trends in where they observe people littering. All six officers agreed that transportation hubs (Underground stations, National Rail stations, and bus stops), businesses, and restaurants were the largest hubs for litter; generally speaking, most litter accumulates in places with the largest concentration of foot traffic. They also unanimously stated that littering happens more frequently during commuting hours and lunch break. We learned that the amount of littering they observe depends on the day, but that days with higher foot traffic generally yield more FPNs. We then investigated if there were any demographic trends that officers observed among frequent litterers, and all six reported that smokers and commuters were the main culprits. Finally, the officers reported that the most common form of litter they saw was cigarette butts, followed by spitting, dog fouling, and public urination.

These responses helped us to focus our anti-littering campaign by narrowing the scope of times, locations, and type of litter to focus on. This information confirmed our background research and helped us determine that cigarette litter in cities is quite common and accumulates near transportation hubs with firsthand accounts from officers who observe this behavior in Lambeth daily. In order to have the most success finding litterbugs and addressing the littering issue within the Borough, we concluded that we would focus our efforts around Underground stations and other transportation hubs, during the morning commute and at lunchtime, and on cigarette litter.

4.2.2 Opinions on FPNs and Littering Policies

We asked the officers questions designed to help us understand their opinions of how effective FPNs are. Four of the six interviewed officers stated that they did not believe that the recent increase in FPN amounts from £80 to £150 changed people's behaviors. This was reaffirmed by half of the officers we interviewed stating that they had issued FPNs to repeat offenders before.

The officers unanimously stated that many of the people that received FPNs were surprised at the cost of the fine. Five of the six officers believed that adding more signs which displayed the FPN amount would be a deterrent that the Council could use to prevent people

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from littering, which corroborates the findings from our research into positive punishment in the form of economic disincentives. We decided to post the maximum FPN amount in our posters since the officers believed that it could be a compelling deterrent. Half of the officers stated that some smokers had difficulties understanding the correct way to use certain ashtrays. Therefore, they suggested an alternative ashtray design could be effective at changing these behaviors.

4.2.3 Officer Observational Study Results

We also took note of trends in littering behaviors and enforcement strategies while observing these six EEOs in Lambeth. One trend that became immediately clear to us was that many smokers outside Waterloo or Vauxhall did not seem to understand how to use the litter bins to properly dispose of their cigarettes, exactly as the officers reported during our interviews. We witnessed a number of people stub out cigarettes on top of these bins and then leave them there, not knowing that once the cigarette is properly extinguished it can be discarded in the bin safely. Since we could see for ourselves that this was a trend among smokers like the officers reported, we understood that our campaign should have some sort of explanation of this method of disposal. Our team then came up with an additional poster design that would help accomplish this goal – a triangular bin topper that would fit the pyramid-shaped bins in these locations and illustrate clear disposal instructions to smokers. The design process of these toppers can be read in Section 3.3.1 and the final designs can be seen in Appendix D: Poster Designs & Bin Topper. This design helped address this issue by telling smokers to ash their cigarettes on top of the bins and then safely trash the cigarette ends inside the bins, using arrows to demonstrate the process. Our team hypothesized that the instruction and clear visibility of these bin toppers would significantly decrease the percentage of smokers that improperly disposed of their cigarettes at these bins with no ashtrays.

4.3 Discussion of Survey, Officer Interview, and Officer Observation Results

From the trends in our survey, officer interviews, and officer observations, we were able to generate conclusions about Lambeth's littering problem. These conclusions were instrumental in developing designs for our litter reduction campaign posters in Section 3.3.1 and in creating recommendations for the Council in Chapter 0.

Attitudes about Littering

Our survey gave us insight into the attitudes of residents and visitors of Lambeth towards littering. Overall, we learned that people disapproved of littering and agreed that action needed to be taken to reduce it. Our respondents also strongly agreed that they would feel guilty if they were caught littering, which suggests that people already understand that they should not litter. This validates our rationale for using a behavior-change approach as described in Section 2.3.1.

Reasons for Littering

We also learned, through analyzing what reasons respondents gave for why they might litter, that people tend to blame external factors (like lack of bins, etc.) instead of internal factors

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(such as laziness or apathy). Similarly, people stated that adding bins would be a more effective way to reduce littering than any other approach, yet in our observations, areas with the most litter often contained numerous accessible litter bins. People said they litter infrequently, if at all, which suggests that littering is more opportunistic than habitual. Because littering is opportunistic, we believe that strategically placed advertisements, posters, or other environmental modifications might help nudge individuals into littering less.

Community Attachment & Engagement

The reasons we discovered for why people litter led to our conclusion that littering in the Borough can be reduced by showing people that it is as much an individual issue as it is the Council's problem by using community attachment strategies. We asked people where they said they live to learn which regional identities could be used to evoke a sense of local pride, which our research showed was a powerful motivating force. We found that most people did not identify strongly with Lambeth, and since many people who litter in the Borough are visitors from elsewhere in the city, we determined that the most powerful regional identity was living in London. Therefore, we chose widely recognizable Lambeth landmarks for our posters, like the London Eye, rather than more regional places like Brixton Academy.

Where Littering Happens

Through our interviews and observational studies with the environmental enforcement officers, we learned that the most littered item is cigarette butts. After seeing the prevalence of this kind of litter compared to others, we narrowed our campaign focus to reducing cigarette butt litter. The officers also unanimously agreed that the littering most often occurs at transportation hubs like Underground stations, to which our survey respondents agreed; therefore, we decided to conduct our studies at these locations.

Opinions About FPNs

Trends that emerged in our conversations with the officers and in our survey responses showed that FPNs were not effectively changing people's behaviors towards littering on their own. The officers also believed that posting the FPN amount would be effective at discouraging people from littering. As such, we decided to include the FPN amount in our poster design as a deterrent. We also witnessed many people who did not properly dispose of their cigarettes, which made these cigarettes end up as litter. Because of this pattern, we decided to create a sticker that clearly explained the proper way to dispose of a cigarette end in a litter bin.

4.4 Campaign Effectiveness

This section explains the trends we found when comparing the results of our baseline observational studies (the pre-campaign studies of littering to gather initial data) to our post-campaign studies to determine effectiveness. Our baseline studies were conducted during our second week and our campaign was implemented and then studied during our fifth week in Lambeth. For a detailed account of how we designed our campaign posters and conducted our observational studies, see Section 3.3: Objective 3: To Design, Test, and Quantify Methods of

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Preventing Littering. The raw data for our observations can be found in Appendix H: Baseline Litter Counts and Appendix I: Post-Campaign Litter Counts.

4.4.1 Baseline Observational Study Results

We first compiled a baseline data set containing how many cigarette ends were disposed of properly, improperly, or littered at each of our three target locations for two different times of day. This data set contains 299 cigarette-related disposals and is summarized below in Figure 4-10. Due to circumstances described in our post-campaign observational studies and Section 4.4.2.1: Special Note on Brixton Station Observational Studies, we excluded the Brixton Morning Observation in the average.

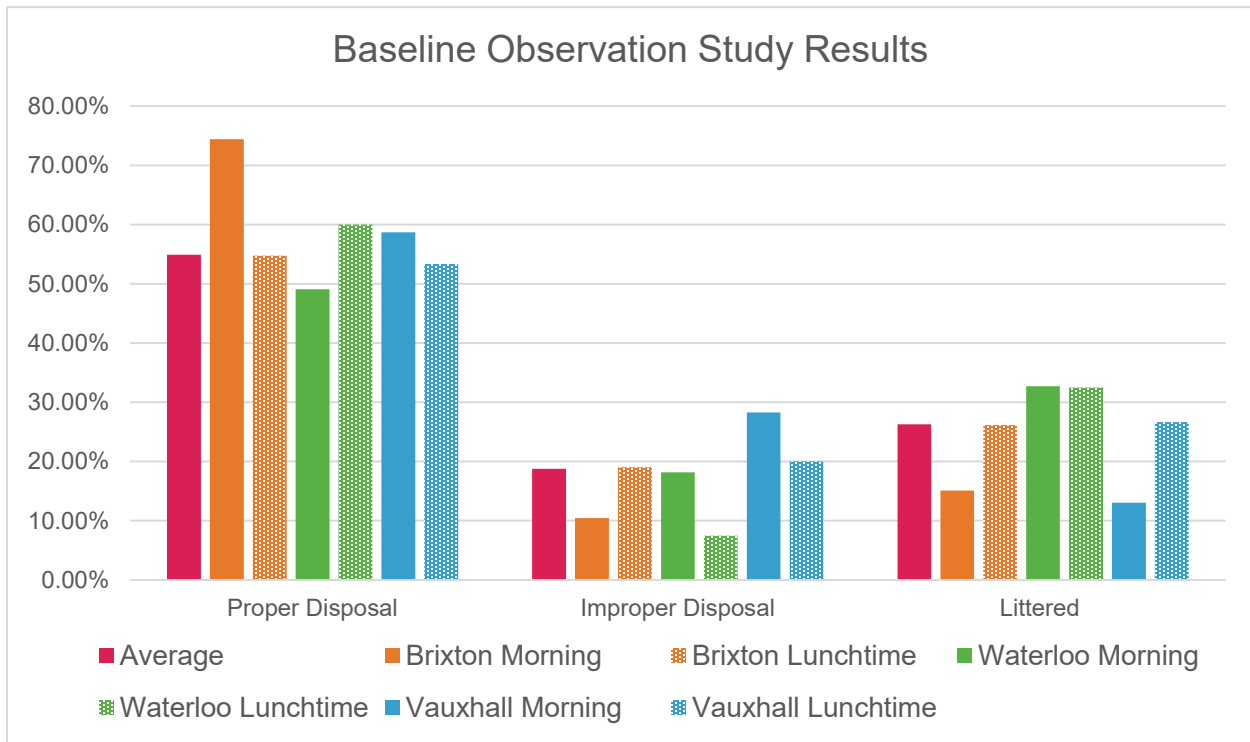


Figure 4-10: Baseline Observation Study Results

The study with the most cigarette-related disposals was the morning at Brixton, with a total of 86 disposals; this also accounted for the largest percentage of proper disposals (74%). We believe that one possibility for the large percentage of proper disposals was because there was such an abundant number of smokers that someone was always smoking at the bin, which gave other smokers a subtle reminder of the proper method of cigarette butt disposal. The study with the least number of cigarettes counted was the lunch observation at Vauxhall with 30 total discarding events. A likely explanation for this is that a rainstorm passed during the beginning of the observation, which could have prevented many would-be smokers from taking their smoke breaks.

We found that 19% of all cigarette discarding events that we witnessed were improper. This validates an alarming trend we learned about in our officer observations and interviews,

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where we learned many smokers were unaware that properly extinguished cigarettes are safe for the litter bins. Our idea to combat this trend was to create educational triangular stickers to attach to the top of litter bins and ultimately teach smokers the proper way to dispose of their cigarettes. We also learned that although many people litter, not everyone is a litterer; in fact, the majority of subjects in our studies properly disposed of their cigarettes (55%). This means 45% of cigarettes end up on the ground, which leaves lots of room for our campaign to improve upon.

4.4.2 Post-Campaign Observation Results

For our final data collection, we went to the same locations at the same times on the same days, only three weeks after our initial studies with one exception. The morning observation at Brixton was not observed post-campaign; this is because temporary barriers outside of the station created an entirely different flow of traffic, which would present a significant confounding variable (See Section 4.4.2.1: Special Note on Brixton Station Observational Studies for more information). We used the same observation techniques to remain consistent between studies. The raw data for this observational study can be found in Appendix I: Post-Campaign Litter Counts. This data set contains 186 cigarette disposals and is summarized below in Figure 4-11.

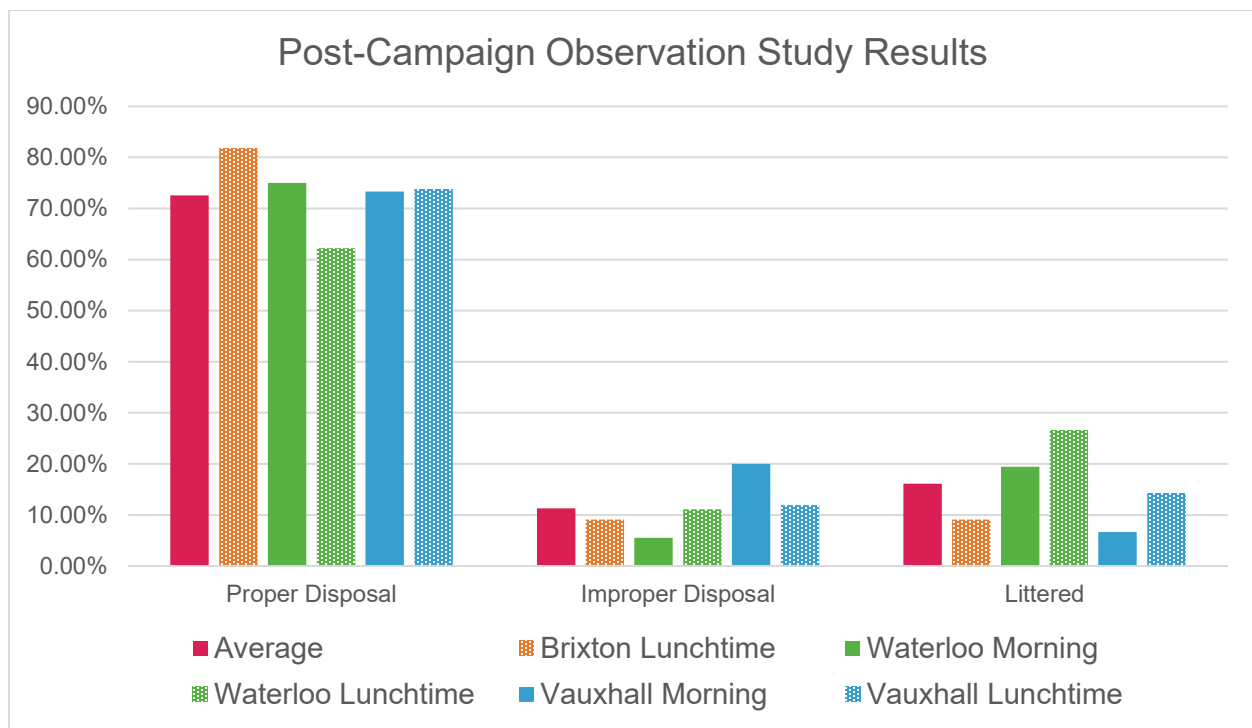


Figure 4-11: Post-Campaign Observational Study Results

This data has a total littered plus improper disposal percentage of 27.5% which is a 39% reduction from the 45% in our baseline study. Therefore, with statistical significance ($p = .008$) we were able to determine that once our campaign was implemented, littering rates decreased by 39%. For our post-campaign studies, Waterloo lunchtime had the greatest number of cigarette disposals (45) and the lowest percentage of proper disposals (62%). The second largest was Vauxhall Lunchtime (42), and these studies were the only two of our post-campaign studies

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where it was raining.

The percentage of proper disposals at all three of our locations increased once our campaign was implemented, as shown in Figure 4-12. With the exception of Waterloo lunchtime, the percent of cigarettes that were properly disposed of during our campaign increased substantially (by at least 15%). Waterloo lunchtime was roughly the same with

only a 2% increase in proper disposals. One possible explanation for this was a large confounding variable between the baseline and post-campaign study at this location. During our baseline observation at Waterloo, there was a large number of environmental enforcement officers present the entire study (no less than 5), which the officers believed made smokers more likely to dispose of their cigarette butts correctly to avoid getting an FPN. When we conducted our post-campaign study there were no officers present for the first 50 minutes and then two were present for the last 10 minutes. This created an environment where smokers knew they would not get caught and potentially prompted more smokers to litter during our post-campaign study.

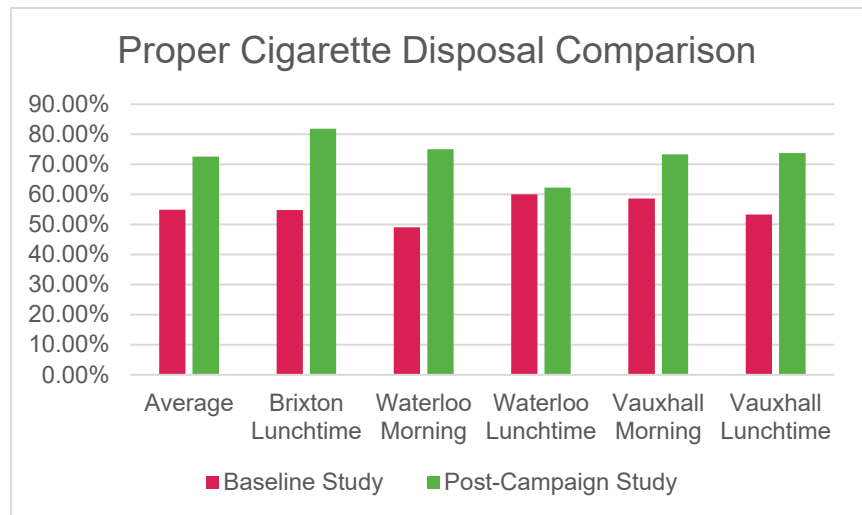


Figure 4-12: Proper Cigarette Disposal Comparison

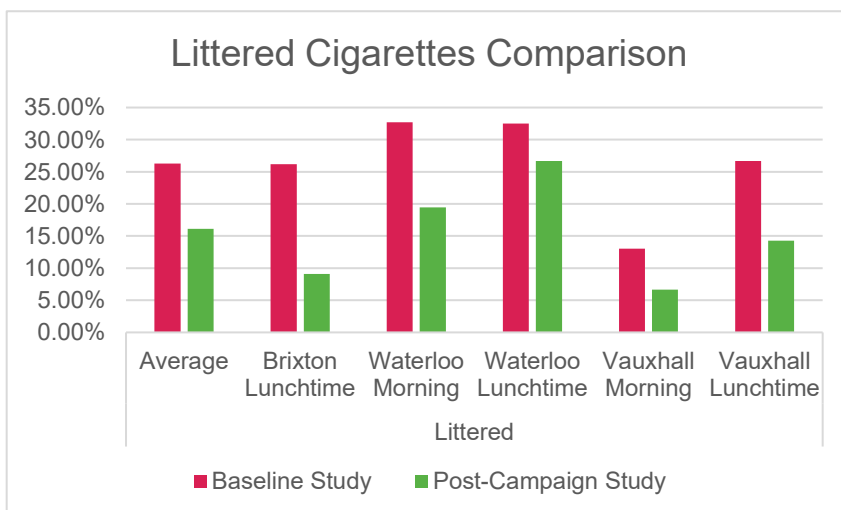


Figure 4-13: Littered Cigarettes Comparison

Once we implemented our campaign, the percent of cigarettes that were littered during our studies decreased in every location as shown in Figure 4-13. We conducted a t-test on littered cigarettes and found that, on average, there was a littering reduction of 39% once our campaign was implemented, with a statistical significance ($p =$

.003). This means there is a 0.3% probability that our results were caused by chance; therefore, our campaign is repeatable and effective. The largest decrease in littering was by 65% during our

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Brixton lunchtime study. Even our lunchtime study at Waterloo, which had the smallest percent of properly disposed of cigarettes, had a reduction of 18% in the people who were littering. This data and our own observations during the study, where many smokers were seen reading our posters, backs up the beneficial impact that our posters must have had on people.

When conducting our post-campaign analysis, we were interested in comparing the improper cigarette disposals from our baseline and post-campaign studies. This is because during our baseline we had created the bin toppers to specifically combat this issue. To determine how effective our bin toppers were, we compared the average improper disposal rate of Waterloo and Vauxhall, which were the locations where we posted our triangular topper, shown in Figure 4-14. Through this analysis we discovered a decrease of 37% in improper disposals (from 18.7% in the baseline to 11.8% post-campaign). However, with a p-value of .08 this result is not as statistically significant as the $p < .05$ that we would have liked to achieve. During our campaign studies we observed the behaviors of smokers and their reactions towards our bin topper stickers.

We discovered that many smokers seemed to take the time to read the topper, especially if they smoked in close proximity to the bin. There was even the occasional smoker who seemed to read the topper, unsure of how to properly dispose of a cigarette at bins without ashtrays. They slowly and cautiously followed the instructions and ended up correctly disposing of their cigarettes. Not all smokers connected with our

advertisements and there were the rare smokers who stubbed out their cigarettes directly on our sticker and proceeded to leave their cigarettes on top of the bin. Despite this, we believe that overall smokers saw our sticker, and many followed the instructions. Although this result is not statistically significant at $p < .05$, it does not mean our bin toppers were not and would not be an effective method to decrease the amount of improperly disposed of cigarettes.

During our campaigns, we kept as many variables consistent as we could control; however, there were some variables that we could not control. These confounding variables included the presence of EEOs during our observation and the weather conditions. When we were conducting our pre-campaign study in Vauxhall at lunchtime, there was some passing showers in the beginning of the study which cleared up as time progressed. In our post-campaign Vauxhall lunchtime study, it was lightly raining for the majority of the time, with a downpour for the last 10 -15 minutes. Additionally, it was also raining for the post-campaign Waterloo lunchtime study.

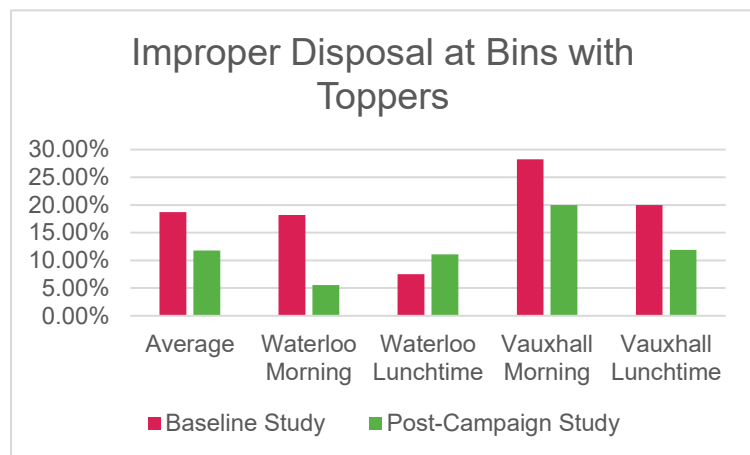


Figure 4-14: Improper Disposal Data at Bins with Toppers

4.4.2.1 Special Note on Brixton Station Observational Studies



Figure 4-15: TfL Temporary Fences at Brixton Underground Station

Our campaign posters were printed and delivered to the Lambeth Civic Centre on Monday February 17, 2020. We planned to begin our secondary observations at Brixton Station the next morning, but upon our arrival, there was an engineering project in progress to work on one of the station's three escalators. This project demanded that Transport for London (TfL) set up a barrier on the sidewalk to form a queue of passengers entering the station. The crowd was about four people wide and quickly backed up approximately 125 meters (410 feet) to the corner. This anomaly created a completely different flow of foot traffic into the station and walled entering passengers off from either of the two litter bins in our observational area (see Figure 4-15). Our team realized that we could no longer perform our morning observation at this location because our data would be far too skewed to be useful to this study. We found out that the barriers would be removed by 10:00, so we could continue with our lunchtime observation and still use this location for one of our two planned studies.

5.0 Recommendations for Lambeth Council

Through our background research, our conversations with environmental enforcement officers, our survey responses, and results from our pilot campaign, we came up with numerous possible ways that littering behavior could be shaped. With our limited time in Lambeth, we could only feasibly test an advertising campaign, but we believe that our other theories on how to reduce littering may also be effective. The following sections outline the methods and strategies the Council can use to reduce future littering, which include:

1. Future anti-littering advertisement campaigns,
2. Ashtray and litter bin design improvements,
3. Locations of litter bins,
4. Volunteer litter cleanup events, and
5. Student education about littering.

5.1 Future Anti-Littering Advertisement Campaigns

In this section, we recommend that Lambeth Council:

1. Continue to develop an anti-littering advertisement campaign,
2. Use bin toppers to reduce improper disposals, and
3. Implement campaigns in high traffic areas.

This section is devoted to the recommendation of future anti-littering advertisement campaigns in Lambeth based on our research and the results of our own campaign. Our baseline observational studies demonstrated that just under half of all cigarettes smoked are either improperly disposed of or littered on the ground. After we designed and implemented our own pilot campaign, we observed a 39% reduction in cigarette litter. This change demonstrates there is a strong probability that a large-scale advertisement campaign would reduce littering in Lambeth; therefore, we recommend that Lambeth Council develop and implement an advertisement campaign of their own.

This campaign could be simple in nature, such as printing posters and sticking them to the sides of litter bins, like what was done in our pilot campaign; or it could be more in-depth and complicated, such as the charity bin campaign where bins were wrapped with the pledge to donate money to charity based on how much litter was inside of bins.

5.1.1 Future Campaign Advertisement Design

A large part of developing a successful advertisement campaign stems from the design of the advertisement and its ability spread a message. In our pilot campaign, our goal was to reduce the amount of cigarette litter, so we developed the clear, concise, and meaningful message “Cigarette ends don’t belong on our streets” (shown in Figure 5-1). A considerable amount of thought and research went into this message, and we ultimately chose possessive words such as “our” to piggyback on a sense of attachment and pride that some members of Lambeth’s community exhibited. To continue this idea, we used images of widely recognizable landmarks that were directly next to our areas of study, such as the London Eye for Waterloo Station or

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Electric Avenue for Brixton Station. We recommend that when Lambeth Council creates their advertisements, they follow a similar method and build off of their resident's own community attachment.

Another aspect of our poster designs that we think is fundamental for the Council to include when they develop their own campaign is to inform individuals of the penalties for committing a littering offense. In our officer interviews, we determined when officers cited people for littering, many were unaware that dropping their cigarette butts on the ground was illegal and they were also very surprised to learn they would have to pay a £150 fine. Our team believes that it is crucial for the Council to address this lack of understanding when they design their advertisements. If they can successfully get people to understand that there are consequences for littering, less littering will occur on the streets of Lambeth.

5.1.2 Using Bin Toppers

There are a large number of bins in Lambeth without an ashtray. When our team was conducting observational studies with the officers and on our own, we noticed that these bins without ashtrays were particularly prone to improper cigarette disposals (where cigarettes are stubbed out and left on bins or thrown directly in bins still lit).

The aspect of our campaign that we developed to combat this was our bin toppers. Unfortunately, in our studies we were unable to determine with sufficient statistical significance that affixing our stickers to the tops of bins reduced the percentage of improper disposals; however, we did notice during our observations that multiple people read the sticker and proceeded to cautiously stub out their cigarette before throwing it in the litter bin. We also noticed that other boroughs in London have "Stub it and Bin it" engraved directly into their cigarette stubber plates. Although these engraved plates are legible and easy to understand, they are not as eye-catching as a colored sticker on the top of bins, especially because many smokers ignore the plate and stub out their cigarettes all over the top of the bins.

Another issue with these improper disposals is that officers do not issue FPNs to people who leave their cigarettes on the bins, even though most of these cigarettes become litter. Since there are currently no repercussions for improper disposal, members of the public will never learn that these are wrong. With this in mind, we recommend that Lambeth Council first use



Figure 5-1: Brixton Poster Design

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some form of informative message in an eye-catching location, such as on top of the bin, to try and limit the number of improper disposals; and second, we recommend the Council instructs EEOs to approach people who do not properly dispose of their cigarettes and then point out the signage and the issues with not putting cigarettes all the way in the bin. Then, after the community has had sufficient time to adjust and learn, we recommend instructing EEOs to start to issue FPNs to those who do not comply. By incorporating the positive punishment of issuing fines and the educational aspects of the bin toppers, the Council will have the greatest likelihood of ridding the streets of unintentional litter that comes from improper disposals.

5.1.3 Campaign Implementation Locations

Our campaign was conducted around three major hubs of transportation (Brixton Station, Waterloo Station, and Vauxhall Station). Our intention for choosing these stations to run a test campaign was primarily that there were lots of people that would walk through our area of study during our test, and therefore a substantial amount of litter that would be easy to study. These three stations in particular also incorporated the different types of people (residents, employees, visitors) that frequent Lambeth. For example, Waterloo would be more commuters coming in from the outer areas of London, people who live in London going out for the day, or visitors coming into the city for the day; whereas Brixton is mostly residents of Lambeth, commuting to other boroughs for their work.

We recommend that the Council target high-traffic areas like these in their campaign. Other areas that the Council should consider could be tourist hotspots like Southbank on the River Thames and town centers like Clapham and Streatham Common. Since many Londoners rely on public transportation, the Council should target their advertisements towards large transportation hubs (Bendix, A., & Florida, R, 2015).

5.2 Improvements to Ashtray and Litter Bin Designs

In this section, we begin with an evaluation of current litter bins in use within Lambeth, and then move on to give recommendations on the topic, which include:

1. Investigate new designs or existing bins with improvements to bin and ashtray functionality and
2. Consider replacing poorly designed bins and cleaning/improving current bins in these areas to decrease improper rubbish and cigarette disposal.

5.2.1 Evaluation of Current Lambeth Bins

One of our most significant observations of littering behavior in Lambeth was the variety in ashtray and litter bin designs at different locations throughout the Borough, and how this seemingly influenced proper usage. For instance, we noticed that the style of bin outside Brixton Station made proper rubbish disposal more difficult than did the style of bins at Vauxhall and Waterloo stations; the openings on the sides of the Brixton bins are small, making it harder for people to push their trash all the way in. This can cause litter to fall out of the bins, which makes them and the surrounding area dirty. This, along with dirty openings, further turned people away from putting their hand inside the bin to push their rubbish all the way in. The ashtrays on top of these bins were also not highly effective. We noticed that the stubber plate was not clearly indicated, and the holes to place the butts were very small and made it more difficult to properly dispose of the extinguished butt. Due to their irregular design, we noticed that a large number of people actually used the flat corners of these bins as ashtrays and many smokers would extinguish their butts either here or on the top surface and not take the extra step to deposit the butt in the bins, as shown in Figure 5-3.

This trend of improper cigarette butt disposal was also seen at bins outside both Vauxhall and Waterloo stations. These bin designs were more accessible for litter disposal but had no designated cigarette disposal location. Through our interviews and observations with environmental enforcement officers (Section 3.2.1), we found that many smokers did not understand the proper method of cigarette disposal at these bins. Many interactions ended by extinguishing the butt on top and then leaving it there to eventually fall to the ground as litter, shown in Figure 5-2 where a pile of extinguished cigarettes had collected just beside the litter bin.

5.2.2 Improvements to Current Bin Designs

Through our conversations with environmental enforcement officers, we found that many of them agreed with our hypothesis that ineffective ashtray designs were at least partially to blame for the



Figure 5-3: Cigarette Ends Left on Top of Brixton Litter Bin



Figure 5-2: Cigarette Litter at Base of Lambeth Litter Bin

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amount of cigarette litter they witnessed in the Borough. In order to correct these mistakes, our team concluded that a newly designed ashtray or even entire litter bin would be most effective. We drew on ashtray designs we have seen previously that were more creatively designed to be noticeable, easy to use, and still functioned to contain extinguished cigarette butts.

One design that we believe would decrease littering behavior is an existing bin we found within another London borough, Islington, which can be seen in Figure 5-4. This design is a combination of the best elements of the Brixton, Vauxhall, and Waterloo bin designs with clear improvements added. It has separate compartments for litter and recycling that are clearly labeled, like the Brixton bins, but it has larger side openings to make disposal very accessible while still protecting rubbish from environmental factors like rain. On either side of the top of the bin are stubber plates which are clearly labeled for cigarette extinguishing, like the Vauxhall and Waterloo bins, and on the top of the bin there is a very large and clearly defined ashtray. This ashtray stands out by being silver metal on a black bin and has very large openings for one to place their cigarette butts in, which is an improvement over the Brixton ashtray design. From our observation, this bin makes it very clear what the proper way to dispose of one's cigarette end is, as opposed to both bin designs we studied in Lambeth. It is also worth noting that the bin shown was very clean, and based on our research into environmental motivating factors of behavioral psychology (Section 2.3.2), this increases the appeal for one to see and use a litter bin in the first place.



Figure 5-4: Islington Litter Bin

5.2.3 Recommended Actions Moving Forward

Aside from recommendations of design changes or new bins, our team would recommend that the Council address some specifically poor bin designs within the Borough. One design in particular is a simple plastic bag suspended on the sides of support beams at Vauxhall Station, across the street from our study location. We understand that this bin is quite convenient in terms of space, cost, maintenance, and ease of use, but it is sub-optimal by our measures of proper bin practicality. Referring to some of the qualities of an ideal bin that we have identified during our project, this design is missing clear visibility, curb appeal, and a functional ashtray. Our recommendations to the Council regarding these bins would be to add ashtrays to the area or redistribute, or possibly purchase, a few bins with better designs to this area and other areas

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which currently have poorly designed bins. Lambeth Council should begin to replace these ineffective bins over time; replacing them in small quantities will help keep costs low while better bins in these areas will bring awareness and visibility to proper rubbish disposal, helping to reduce litter overall.

Our team understands that it is neither viable nor cost effective for the Council to replace all ineffective bins at once, but we do have some suggestions that could help mitigate the effects of poorly designed bins at Brixton Station. We would recommend instructing Veolia employees, who already empty these bins, to also clean the openings like they clean the tops of bins at Vauxhall Station. This will ensure that ash and grime do not accumulate on the outside of the bins, which would further deter people from properly using them. We also believe that once cigarettes and ash are removed from the tops of these bins, they will have more curb appeal and attract higher rates of proper usage from cigarette smokers.

5.3 Optimizing Litter Bin Locations

In this section, we recommend that Lambeth Council:

1. Carefully consider the locations of litter bins in highly trafficked areas,
2. Redistribute specific bins outside Vauxhall station, and
3. Consider installing ashtrays to the sides of buildings in highly trafficked areas, like under awnings and roofs outside Underground stations.

Through our survey results of those found in Lambeth, 75% of people noted that an increase in bins would be one of the most effective methods to reduce litter. This contradicts what we learned through our observation of the area as we found bins to be ubiquitous on busy high streets and in areas of high congregation. We also found it interesting that more of Lambeth's visitors than residents felt that this was an effective method to reduce littering by 11 percentage points. We believe that these discrepancies can be explained by the conclusion that the more people have an opportunity to observe these bins, the less they believe that bins are lacking. Consequently, we believe that bins in Lambeth are either not noticeable enough or not placed in the most effective locations. Therefore, our team recommends that Lambeth Council not only alter the appearance of their litter bins, like with our posters, but also put some careful thought and strategy into their specific placements in busy areas so as to increase awareness of their ubiquity.

We did observe some specific cases where moving a litter



Figure 5-5: Suggested Arrangement of Vauxhall Litter Bins

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bin would likely increase its visibility and usage, which were outside Vauxhall Station. Our study zone here included three litter bins, all of which were clustered together on only one side of the street. We felt that if these bins were redistributed so that one was placed on the other side of the crosswalk, it might allow more people to notice and subsequently use it rather than littering their cigarettes or other rubbish. Our suggested arrangement can be seen in Figure 5-5. We noticed another irregular bin placement just outside our zone at Vauxhall where two litter bins were placed directly across from each other on the footway, and we would recommend that these be separated and redistributed as well to maximize their usage. The current placement of these bins can be seen in Figure 5-6.



Figure 5-6: Litter Bin Placement at Vauxhall

During our observational studies we learned that many smokers tend to smoke in shaded, comfortable areas that are generally close to buildings and without easy access to litter bins. This is because all the litter bins and many ashtrays are placed next to the street and away from the buildings. Although this makes the bins clearly visible and accessible to most pedestrians, it requires that smokers put in extra effort to properly dispose of their cigarettes. Through our observations, it was clear to us that this extra effort led many smokers to litter their cigarette ends instead. Therefore, we suggest that Lambeth Council adds ashtrays to the locations where smokers generally congregate and litter. These locations can be informed by the EEOs who watch people smoking in these areas every day.

5.4 Organizing a Lambeth Litter Cleanup Event

In this section, we recommend that Lambeth Council:

1. Organize and run an annual litter cleanup event with help from local business sponsorship.

When researching what kinds of campaigns were successful in reducing littering, programs such as the Great British Spring Clean seemed effective. As stated in Sections 2.4.1 and 2.4.2, this campaign focused on community involvement to reduce littering, which helped make areas cleaner while educating people on the harmful effects of littering to instill lasting behavior-change. Through our survey data we found that 45% of people, including 54% of Lambeth

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residents, responded that they would have an interest in participating in a borough-wide cleanup event. This reassured us that a cleanup event could be a successful campaign in Lambeth and has a strong potential to affect change in people's littering behavior. We recommend that the Council investigate the requirements to organize and run this type of event annually and decide how feasible it is for Lambeth. To ease the costs of setting up such an event, we also recommend that the Council seek sponsorship from local businesses that stand to benefit from a cleaner area and publicity from helping to fund the event.

5.5 Educational Campaign for Schoolchildren

In this section, we recommend that Lambeth Council:

1. Create information sessions for young students in order to inform them on the negative effects of litter and
2. Have the students apply the information from the session by creating campaign materials.

We believe that educating the youth on the negative effects of littering will make them less likely to become litterers themselves, which is supported by our survey respondents agreeing that a lack of public education is leading to the littering present in the Borough. Our research corroborates this; the litter less campaign (see Section 2.4.1) has shown that engaging students was effective at making them passionate and vocal about littering, to the point where students encouraged their friends and family to not litter. We have a few possible educational ideas that involve the use of information sessions paired with creative applications of this information that we recommend the Council adapt and target towards younger kids who are more open to this new education.

5.5.1 Informational Session

All our ideas would begin with an information session on the negative effects of litter. This could be taught by people from the Highways and Environmental Enforcement Team, environmental enforcement officers, or the schoolteachers themselves with information from the Council. Once the instructors are selected, they should use visual presentations with interesting graphics and imagery to present facts on litter and explain the negative effects it has on the well-being of humans and our planet. This session would be beneficial to educate students and get them ready to apply their knowledge in the next sections.

5.5.2 Information Application: Poster Design

With their creativity sparked, the newly informed students could work in groups to create posters which will show that they have learned the negative effects of littering. Students would then bring their posters home to their parents and explain what they learned about the littering. This is beneficial as it not only reinforces the information for the students, but this interaction informs the parents as well. These pieces of artwork could then even be possibly used by the Council as advertisements, with permission from the students and their parents, in order to make an effective anti-littering campaign.

5.5.3 Information Application: Bin Painting

Another possible creative outlet for the informed students would be to have them paint litter bins. These bins could then be used to replace other bins that need repair; their interesting appearance will attract attention and nudge people to throw their trash away, therefore creating less litter on the streets. Ultimately, these educational sessions will inform young children on the negative effects of littering, and the campaign material they create during these sessions could be very effective at changing others' behaviors.

6.0 Conclusions

The goal of this project was to develop and test an implementable anti-littering strategy that Lambeth Council could use to reduce littering in their borough. After researching littering behaviors, the specifics of littering in Lambeth, motivational psychology, and previous littering campaigns, our team created a plan to understand littering in Lambeth that ultimately rendered enough information to make informed recommendations to the Council. By considering these recommendations and continuing their efforts to reduce littering, the Highways and Environmental Enforcement Team can preserve Lambeth's environment, reduce cleanup costs, and improve the quality of life for all who live and work there. Our recommendations to Lambeth Council include:

1. Future Anti-Littering Advertisement Campaigns,
2. Improvements to Ashtray and Litter Bin Designs,
3. Optimizing Litter Bin Locations,
4. Organizing a Lambeth Litter Cleanup Event, and
5. Educational Campaign for Schoolchildren.

In the limited time our team had in Lambeth, we were able to gain a lot of information about local littering behaviors, but we had to focus our research on a specific kind of littering – cigarette litter at transportation hubs – to be able to conduct meaningful experiments. Though this form of litter is widespread and significant, it is only a subset of the larger issue of litter within the Borough. With the information we gathered from our survey, officer interviews, and officer observations, we developed an advertising campaign for Lambeth's transportation hubs that successfully reduced littering, proving that advertising campaigns are a viable strategy for Lambeth Council. We believe, based on our findings, that Lambeth Council should continue to pursue advertising strategies and also incorporate our recommendations in Chapter 5.0.

It is worth noting that we were only able to observe littering and test our campaign twice at our three chosen locations before and after we piloted our campaign. Also, our survey results are limited in statistical significance since we were not able to get a statistically random sample of a large enough portion of our target population. We also would have liked to be able to reach more people with our survey so that we could have determined with a higher degree of confidence if there were more trends among demographic segments in our data.

During our studies, we identified a few areas that the Council or future researchers could investigate to better understand how to reduce littering through behavior-change approaches. While our studies showed that having a poster present did help to reduce cigarette litter, we have not tested how effective different design elements, poster placements, poster quantities, or messages would be. We propose that future researchers could undertake a similar study to ours in Section 3.3.2 but with different variations in these parameters and at more locations. Additionally, future studies should be conducted that investigate other types of litter, though new methodologies would have to be developed as we found it much more difficult to quantify most other forms of litter.

Finally, we would like to thank our liaisons for the opportunity to work with them to

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reduce littering in Lambeth and the employees at APCOA and Lambeth Council that we spoke to. Their generous support, insights, and ideas were instrumental to the success of this project and we hope that our results, conclusions, and recommendations can help them in the future.

References

- APCOA Parking. (2016, October 18). APCOA Wins Lambeth Contract with expanded role for EEOs. Retrieved from <https://www.apcoa.co.uk/press-news/latest-news/article/apcoa-wins-lambeth-contract-with-expanded-role-for-EEOs/>
- Bendix, A., & Florida, R. (2015, September 24). How London and Berlin's Daily Travel Habits Compare to the U.S. Retrieved from <https://www.citylab.com/transportation/2015/09/how-london-and-berlins-daily-travel-habits-compare-to-the-us/406840/>
- Bin it for Good. (2019). Retrieved from <https://www.keepbritaintidy.org/local-authorities/reduce-litter/general-litter/bin-it-good>
- Lyndhurst. (2013). Rapid Evidence Review of Littering Behaviour and Anti-Litter Policies. Retrieved from <https://www.zerowastescotland.org.uk/sites/default/files/Rapid%20Evidence%20Review%20of%20Littering%20Behaviour%20and%20Anti-Litter%20Policies.pdf>
- Calvert, W. (2018, April 4). How dropping your cigarette could land you with a £1,000 fine. Retrieved from <https://www.thesun.co.uk/money/5971980/how-much-is-fine-for-dropping-your-cigarette-and-what-are-fixed-penalty-notice/>
- Campbell, F. (2007). People Who Litter. Pretoria: Environmental Campaigns. Retrieved from https://www.keepbritaintidy.org/sites/default/files/resources/KBT_London-Its-People-and-their-Litter_2009.pdf
- Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, 12(4), 105-109. Retrieved from <http://www.jstor.org/stable/20182853>
- CENN. (2019). Reasons, Consequences and Possible Solutions of Littering. Retrieved from <http://environment.cenn.org/waste-management/publications/reasons-consequences-possible-solutions-littering/>
- Devoe, N. (2017, July 15). People Are Trashing This Anti-Littering Campaign for Being Sexist. Retrieved from <https://www.seventeen.com/life/news/a33839/anti-littering-campaign-is-really-sexist/>
- Environmental Protection Act 1990. (1990, November 1). Retrieved from <http://www.legislation.gov.uk/ukpga/1990/43/part/IV>
- Environmental Protection Agency. (2015). Impacts of mismanaged trash. Retrieved from <https://www.epa.gov/trash-free-waters/impacts-mismanaged-trash>
- FEE. (2017). Learning, Leading, Action, & Community: The Litter Less Campaign Impact Measurement & Evaluation Project. Retrieved from <https://static1.squarespace.com/static/552bcd30e4b02ed06b97c76d/t/5a82c04ff9619af3c624bcc2/1518518375757/Litter+Less+Campaign+Brochure-r2.pdf>
- Fly-tipping: What you wanted to know. (2017, October 20). Retrieved from <https://www.bbc.com/news/uk-england-41685102>
- Free Stuff. (2019). Retrieved November 29, 2019, from <http://www.dontmesswithtexas.org/get->

USING BEHAVIOR-CHANGE STRATEGIES TO REDUCE LITTERING IN LAMBETH

- stuff/free-stuff/
- Gabbatiss, J. (2018, June 18) Motorway drivers will get cash vouchers for binning coffee cups. Retrieved from <https://www.independent.co.uk/news/uk/home-news/drivers-bin-coffee-cups-plastic-bottles-reward-motorway-litter-rubbish-waste-a8404596.html>
- Great British Spring Clean. (2019, April 13). Retrieved from <https://www.keepbritaintidy.org/get-involved/support-our-campaigns/great-british-spring-clean>
- How to Recycle and Reduce Your Waste. (2019). Retrieved from <https://www.loveessex.org/>
- Keep Britain Tidy. (n.d.). Smoking-related litter. Retrieved from <https://www.keepbritaintidy.org/local-authorities/reduce-litter/smoking-related-litter>
- Kingdom Services Group. Litter: Its impact on local communities. Retrieved from <https://www.kingdom.co.uk/articles/impact-of-litter-on-local-communities/>
- Kolodko, J., Read, D., & Taj, U. (2016). Using behavioural insights to reduce littering in the UK. Retrieved from <https://cleanupbritain.org/WBS-Report-for-CLUB.pdf>
- Lambeth Borough Council - Summary reports. (n.d.). Retrieved November 12, 2019, from: <https://www.fixmystreet.com/reports/Lambeth>
- Lambeth Council. (2016). State of the Borough 2016. Retrieved from [https://www.lambeth.gov.uk/sites/default/files/State of Borough 2016 - v3.pdf](https://www.lambeth.gov.uk/sites/default/files/State%20of%20Borough%202016%20-%20v3.pdf)
- Lambeth Council. (2019). Increase fixed penalty charges for littering and abandoned vehicles. Retrieved from <https://moderngov.lambeth.gov.uk/documents/s107531/FPN%20Price%20Increase%20CMDR.pdf>
- Lewis, A., Turton, P., & Sweetman, T. (2009). In Caldecott B. (Ed.), *Litterbugs*. London, UK: Policy Exchange. Retrieved from <https://policyexchange.org.uk/wp-content/uploads/2016/09/litterbugs-mar-09.pdf>
- Living in The London Borough of Lambeth. (2019). Retrieved from <https://www.onedome.com/locations/uk/england/london/moving-to-lambeth>
- London Loves Business. (2019). The big smoke, study maps London smoking rates. Retrieved from <https://londonlovesbusiness.com/the-big-smoke-study-maps-london-smoking-rates/>
- Madsen, K. (2019). Litter Less Campaign: The longest-running school campaign on litter continues. Retrieved from <https://www.fee.global/newsstories/2019/9/25/press-release-litter-less-campaign-the-longest-running-school-campaign-on-litter-continues>
- Miller, D. T., & Prentice, D. A. (2013). Psychological levers of behavior change. In E. Shafir (Ed.), *The behavioral foundations of public policy* (pp. 301-309) Princeton University Press. doi: 10.2307/j.ctv550cbm.23 Retrieved from <http://www.jstor.org/stable/j.ctv550cbm.23>
- Ministry of Housing, Communities & Local Government. (2019, September 26). Litter and littering in England 2017 to 2018. Retrieved from <https://www.gov.uk/government/publications/litter-and-littering-in-england-data-dashboard/litter-and-littering-in-england-2017-to-2018>
- Not on our streets (2018, August 16). Retrieved from <https://love.lambeth.gov.uk/not-on-our-streets/>

USING BEHAVIOR-CHANGE STRATEGIES TO REDUCE LITTERING IN LAMBETH

- Office for National Statistics. (2019a). Adult smoking habits in the UK: 2018. Retrieved from <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/bulletins/adultsmokinghabitsingreatbritain/2018>
- Office for National Statistics. (2019b). Population estimates for the UK, England and Wales, Scotland and Northern Ireland: Mid-2018. Retrieved from: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland>
- OpenStreetMap contributors. (2020) Relation: London Borough of Lambeth. Retrieved from <https://planet.openstreetmap.org>.
- Patel, V., Thomson, G. W., & Wilson, N. (2013). Cigarette butt littering in city streets: A new methodology for studying and results. *Tobacco Control*, 22(1), 59-62. Retrieved from <http://www.jstor.org/stable/43289299>
- Sea Life London Aquarium. (2019, November 27). Retrieved January 31, 2020, from <https://blog.londonpass.com/sea-life-london-aquarium-faqs/>
- 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 & Behavior*, 45(1), 35-59. doi:10.1177/0013916511412179
- Siebrits, J. (2018). London Living 2018: A borough by borough review. CBRE. Retrieved from <https://www.cbreresidential.com/uk/sites/uk-residential/files/CBRE0652%20Borough%20by%20Borough%202018%20v18.pdf>
- Southbank Centre. (2018). Annual Report and Accounts 2017-18. Retrieved from <https://bynder.southbankcentre.co.uk/m/06aca71a159123b9/original/Southbank-Centre-Annual-Report-2017-18-signed-FINAL-version.pdf>
- Survey Protection. (2019). Retrieved December 6, 2019, from <https://www.qualtrics.com/support/survey-platform/survey-module/survey-options/survey-protection/>
- The Ballot Bin is a Customizable Ashtray. (2019). Retrieved from <https://ballotbin.co.uk/about/>
- The Facts About Litter. (2017). Retrieved from <https://www.litterbins.co.uk/blog/the-facts-about-litter/>
- Torgler, B., García-Valiñas, M. A., & Macintyre, A. (2012). Justifiability of littering: An empirical investigation. *Environmental Values*, 21(2), 209-231. Retrieved from <http://www.jstor.org/stable/23240362>
- Transport for London. (2018, February 28). Bins, rubbish and delays on the London underground system. Retrieved from <https://tfl.gov.uk/corporate/transparency/freedom-of-information/foi-request-detail?referenceId=FOI-2657-1718>
- Video Tour of Lambeth in London. (2015, March 9). Retrieved from <https://www.nyhabitat.com/blog/2015/03/09/london-video-tour-lambeth/>
- White, K., Simpson, B., & Argo, J. (2014). The Motivating Role of Dissociative Out-Groups in Encouraging Positive Consumer Behaviors. *Journal of Marketing Research*, 51(4), 433-447. Retrieved from <https://www.jstor.org/stable/26661845>

USING BEHAVIOR-CHANGE STRATEGIES TO REDUCE LITTERING IN LAMBETH

Witton, B. (2019). New Charges for Littering and Abandoned Vehicles in Lambeth. Retrieved from <https://www.wandsworthguardian.co.uk/news/17843804.new-charges-littering-abandoned-vehicles-lambeth/>

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Appendix A: Project Schedule

Assignment / Deliverable / Milestone	16-Jan	20-Jan	23-Jan	27-Jan	30-Jan	3-Feb	6-Feb	10-Feb	13-Feb	17-Feb	20-Feb	24-Feb	27-Feb	2-Mar	5-Mar
Prep															
Talk to Sponsor - set up survey distribution, officer observation, and interviews	X														
Objective 1 Tasks: To Understand Individuals' Attitudes of Littering in Lambeth															
General Public Survey		Release			Conclude			Use Data			Close				
Analysis of survey data					Canvassing				X						
Objective 2 Tasks: To Characterize the Littering Problem in Lambeth															
Observe Lambeth Officer for a day			X												
Interview Lambeth Officers						X									
Observe littering behavior in various parts of the borough					X										
Analysis of observational data & interview data							X								
Objective 3 Tasks: To Evaluate and Test Methods of Preventing Littering															
Determine resource needs for small-scale campaigns					X										
Coordinate resource needs with council					X										
Create informed experimental small-scale campaigns							X								
Test small-scale campaigns in different parts of borough											X				
Analyze effectiveness of small-scale campaigns through observation												X			
Objective 4 Tasks: To Develop a Litter Reduction Plan for Lambeth															
Create recommendations for future anti-littering campaigns													X		
Create recommendations for adjusting current policy													X		
IOP Report & Presentations															
Critical Review of Background 1-31-20					X										
Revise Background and References 2-5-20							X								
Intro and Methods revisions 2-12-20									X						
Set up web template 2-13-20									X						
Revise findings chapter 2-19-20											X				
Draft Paper 2-26-20														X	
Draft Presentation 2-27-20														X	
Draft Abstract and Exec Summary 2-28-30														X	
Final Sponsor Presentation (3-3-20 group, 3-4-20 sponsor)															X
Paper Due 3-3-20															X
eCDR 3-6-20															X

Appendix B: Resident & Visitor Survey Questions

Thank you for taking this short survey. The purpose of this survey is to assist the London Borough of Lambeth understand residents' and visitors' attitudes towards littering and is part of a research project conducted by students at Worcester Polytechnic Institute, a university in Worcester, Massachusetts, USA. Your participation is completely voluntary, and you may choose to answer as many or as few questions as you like. Your responses are *anonymous and confidential*. Aggregate data from this survey will be published.

If you have any questions or concerns about this survey, you may contact the researchers at [gr-london20lambeth@wpi.edu](mailto:london20lambeth@wpi.edu). For ethical concerns about the content of this survey, feel free to contact Worcester Polytechnic Institute's Institutional Review Board at irb@wpi.edu.

1) What is your age? (**You must be 18 years of age or older to fill out this survey**)

☐ 18-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-65 ☐ 65+ ☐ Prefer not to answer

2) What region best describes where you live?

☐ Northern Lambeth ☐ Southern Lambeth ☐ London ☐ United Kingdom ☐ Outside of U.K. ☐ Prefer not to answer

3) **If you live in London:** When people ask me where I'm from, I usually say:

☐ London ☐ The borough that I live in ☐ The ward or neighborhood that I live in ☐ I don't live in London

☐ Other. Please Specify: _____

4) What gender do you identify as?

☐ Female ☐ Male ☐ Other ☐ Prefer not to answer

5) Are you a smoker?

☐ Yes ☐ No

6) What best describes the reason for your visit to Lambeth today? **Check all that apply**

☐ Resident ☐ Visitor ☐ Worker or Employed here ☐ Landlord or Business owner ☐ Community leader

☐ Other. Please Specify: _____

7) How often are you in Lambeth?

☐ Daily ☐ Weekly ☐ Monthly ☐ Infrequently

8) When was the last time you littered (Littering is improperly disposing of any item or substance, including but not limited to cigarette butts, food waste, wrappers, urine, etc.)?

☐ Today ☐ Past Week ☐ Past Month ☐ Past year ☐ Over a year ago ☐ Never

9) Have you ever received a Fixed Penalty Notice (FPN) or warning for littering?

☐ Yes ☐ No

10) What reasons could compel you to litter? **Check all that apply**

<input type="checkbox"/> I don't want to carry my litter anymore	<input type="checkbox"/> There we no accessible litter bins	<input type="checkbox"/> The litter bin was overflowing	<input type="checkbox"/> The litter bin was exceedingly dirty or damaged
<input type="checkbox"/> The area I'm in is already littered and one piece won't change anything	<input type="checkbox"/> Nobody will see me doing it and I won't get caught	<input type="checkbox"/> I don't see littering as a problem	<input type="checkbox"/> Other. Please Specify: _____

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11) On a scale from 1-5, rate how much you agree to the following statements.

1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree

	1	2	3	4	5
I see too much litter in the borough					
Littering is unacceptable					
Addressing littering is very important					
Littering is worse now than it was two years ago					
People litter because of a lack of education about littering					
I would feel guilty if caught littering					
People litter because they don't think they'll be caught					
People litter because the fines for littering aren't high enough					
I support the recent increases in FPNs (Littering Fines) in the borough of Lambeth from £80 to £150					
If offered, I would participate in a community litter cleanup event on a weekend					

12) Where do you primarily see litter? **Check all that apply**

☐ On the street ☐ In or around public transportation hubs ☐ Near schools ☐ Private property ☐ Near restaurants and businesses ☐ Recreation areas, open spaces, and parks

☐ Other. Please Specify: _____

13) What do you think are the most effective changes that Lambeth Council could make to reduce littering?

Check all that apply

☐ Smaller fines ☐ Larger fines ☐ More litter bins ☐ Less litter bins ☐ More ashtrays ☐ Public education

☐ Advertisements ☐ Public clean-up events ☐ Other. Please Specify: _____

If you have any other thoughts about littering in the London Borough of Lambeth, you may share them below:

Thank you for your participation! If you have any further questions, please contact us via email at:

gr-london20lambeth@wpi.edu.

Appendix C: Environmental Enforcement Officer Interview Schedule

1. Questions about the workings of their job
 - a. What do you look for when deciding where to set up and look for litterers?
 - b. How many FPNs would you estimate you give out in a day? In a week?
 - c. How do people caught littering and issued FPNs typically react to this interaction?
 - d. What is one of the most interesting stories you have from your job experience?
2. Questions about their experience of the littering demographics in Lambeth
 - a. Where do you typically observe the most litter?
 - b. Is there a trend for time of day that you observe more litter?
 - c. Is there a certain demographic of people you observe littering/issue FPNs to more often than others? (gender, approximate age, activities [smoking, eating, etc.], resident or visitor to borough, etc.)
 - d. What types of litter do you most often see and cite FPNs for?
3. Questions about their opinions of FPN effectiveness
 - a. Do you tend to see repeat offenders after receiving an FPN?
 - b. Do you think the Council's FPN policy and pricing has effectively reduced littering behavior in Lambeth?
 - c. Are there any other methods you have considered that might be more effective in achieving this goal?

Appendix D: Poster Designs & Bin Topper



Brixton 1



Brixton 2



Vauxhall



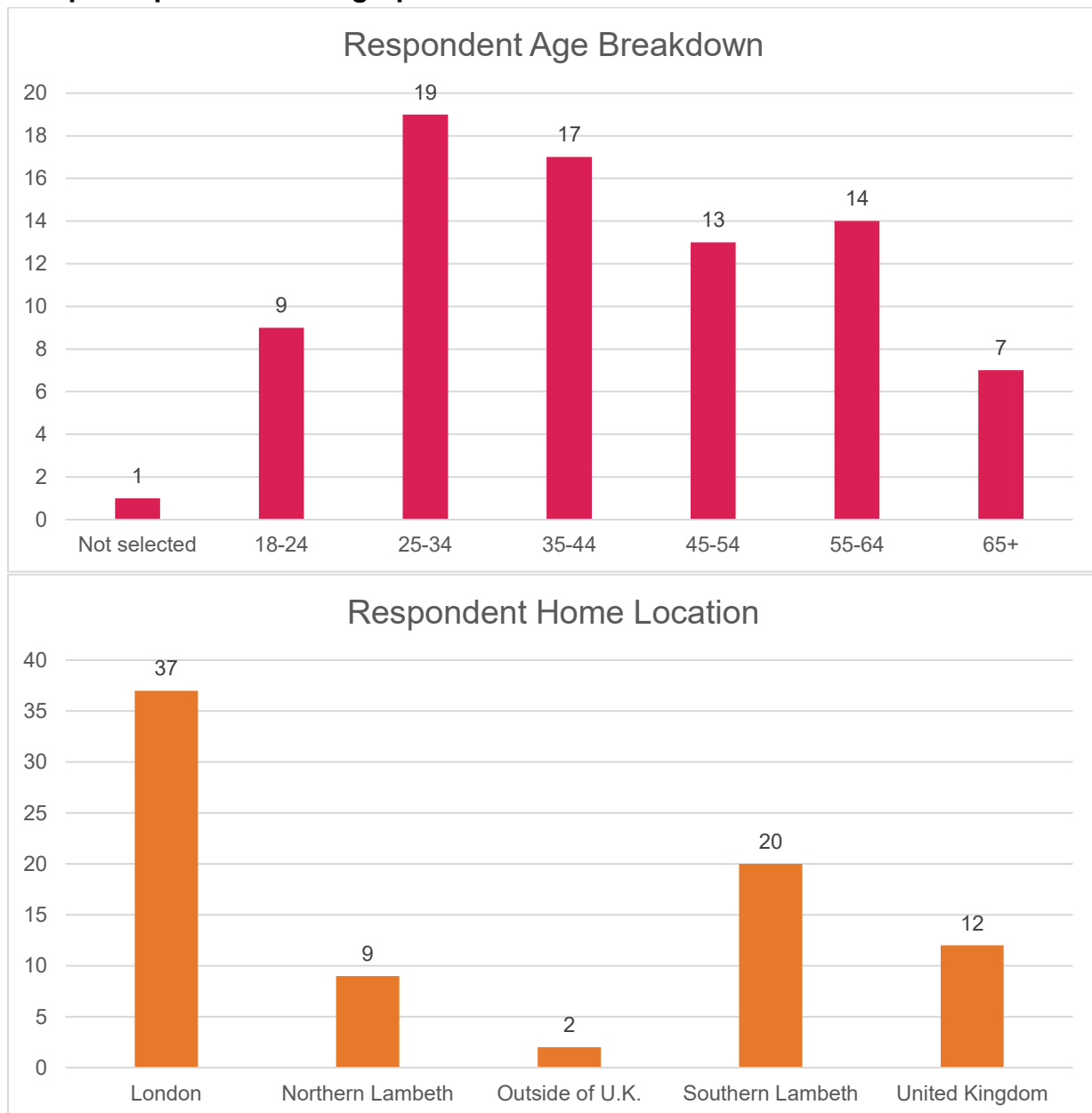
Waterloo



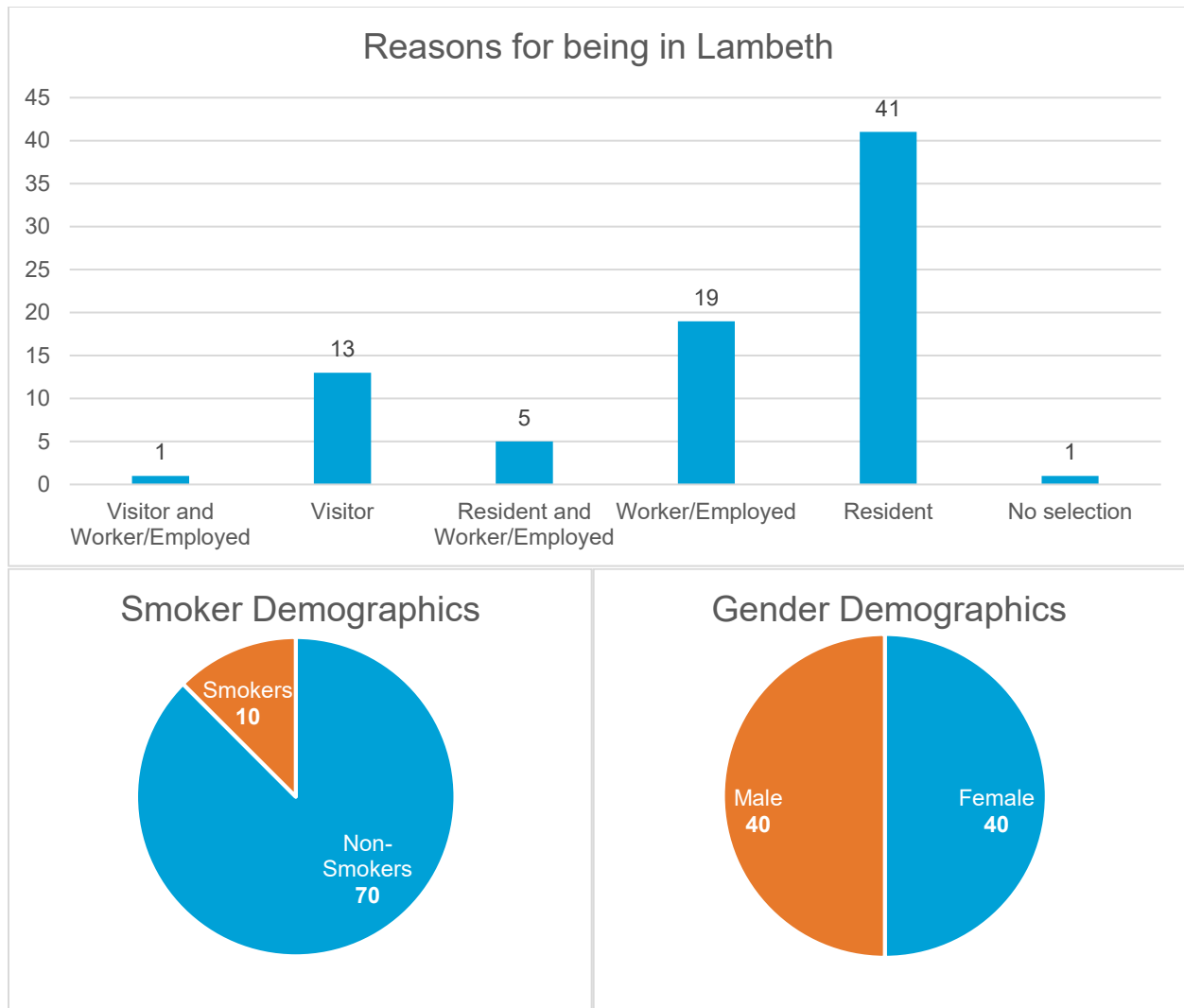
Litter Bin Top Graphic

Appendix E: Survey Responses Aggregate Data

Sample Population Demographics:



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Survey Response Averages Analyzed by Age Group:

What reasons could compel you to litter? Check all that apply (% agreeing)							
Reason	Survey Average	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
I don't want to carry my litter anymore	10.00%	22.22%	15.79%	5.88%	7.69%	7.14%	0.00%
There are no accessible litter bins	35.00%	22.22%	57.89%	23.53%	38.46%	28.57%	14.29%
The litter bin was overflowing	26.25%	22.22%	36.84%	35.29%	23.08%	14.29%	14.29%
The litter bins were exceedingly dirty or damaged	6.25%	0.00%	10.53%	0.00%	0.00%	14.29%	0.00%
The area I'm in is already littered and one piece won't change anything	2.50%	11.11%	5.26%	0.00%	0.00%	0.00%	0.00%
Nobody will see me doing it and I won't get caught	3.75%	22.22%	0.00%	5.88%	0.00%	0.00%	0.00%
I don't see littering as a problem	1.25%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%
Other	28.75%	0.00%	5.26%	41.18%	38.46%	50.00%	42.86%

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Where do you primarily see litter? Check all that apply (% agreeing)							
Where	Survey Average	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
On the street or footway	90.00%	77.78%	89.47%	94.12%	84.62%	92.86%	100.00%
In or around public transportation hubs	60.00%	55.56%	47.37%	76.47%	61.54%	64.29%	42.86%
Near schools	21.25%	0.00%	10.53%	41.18%	23.08%	21.43%	28.57%
Private property	16.25%	33.33%	10.53%	11.76%	23.08%	21.43%	0.00%
Near restaurants or businesses	60.00%	22.22%	52.63%	64.71%	53.85%	78.57%	85.71%
Recreational areas	57.50%	55.56%	63.16%	52.94%	69.23%	50.00%	42.86%
Other	3.75%	0.00%	0.00%	5.88%	7.69%	7.14%	0.00%

What do you think are the most effective changes that Lambeth Council could make to reduce littering? Check all that apply (% agreeing)							
Recommendation	Survey Average	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
Smaller fines	1.25%	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%
Larger fines	33.75%	11.11%	42.11%	35.29%	23.08%	35.71%	42.86%
More litter bins	75.00%	77.78%	73.68%	64.71%	69.23%	85.71%	85.71%
Fewer litter bins	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
More ashtrays	33.75%	22.22%	42.11%	29.41%	53.85%	35.71%	0.00%
Public education	67.50%	22.22%	68.42%	88.24%	53.85%	85.71%	57.14%
Advertisements	51.25%	55.56%	42.11%	70.59%	61.54%	42.86%	14.29%
Public clean-up events	48.75%	44.44%	42.11%	64.71%	46.15%	71.43%	0.00%
Other	17.50%	11.11%	5.26%	29.41%	23.08%	28.57%	0.00%

When was the last time that you littered? (% agreeing)							
Frequency	Survey Average	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
Never	60.00%	66.67%	26.32%	70.59%	61.54%	71.43%	85.71%
Over a year ago	7.50%	11.11%	15.79%	0.00%	0.00%	7.14%	14.29%
Past Year	18.75%	11.11%	15.79%	23.53%	30.77%	21.43%	0.00%
Past Month	8.75%	0.00%	31.58%	0.00%	7.69%	0.00%	0.00%
Past Week	3.75%	0.00%	10.53%	5.88%	0.00%	0.00%	0.00%
Today	1.25%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%

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On a scale from 1-5, rate how much you agree to the following statements. 1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree (average)							
Question	Survey Average	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
I see too much litter in the borough	3.7949	4	3.5263	3.8235	3.5385	4.1429	4.1667
Littering is unacceptable	4.8375	5	4.5263	4.8824	5	5	4.7143
Addressing littering is very important	4.5375	4.5556	4.1053	4.5882	4.7692	4.5714	5
Littering is worse that it was two years ago	3.1538	3.125	3	2.9412	3.4615	3.2857	3
People litter because of lack of education about littering	3.4615	3.5556	2.9474	2.8824	4.0833	3.8571	4.1667
I would feel guilty if caught littering	4.7	4.7778	4.4211	4.9412	4.6154	4.8571	4.5714
People litter because they don't think they'll be caught	3.9615	4.5556	4.3684	3.9412	3.6667	4	2.1667
People litter because the fines for littering aren't high enough	3.0886	3.2222	2.7895	3.0588	2.9231	3.2857	3.5
I support the recent increases in FPNs (Littering Fines) in the borough of Lambeth from 80 to 150	4.025	3.7778	3.7895	4.2353	4	3.9286	4.5714
If offered, I would participate in a community litter cleanup event on a weekend	3.1169	2.875	2.3684	3.6875	2.9231	3.4286	4.1667

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Survey Response Averages Analyzed by Demographic Segment (Visitor, Resident, Employed, Prior littering admitted, Smokers, Male, and Female):

What reasons could compel you to litter? Check all that apply (% agreeing)								
Reason	Survey Average	Visitors	Residents	Employed in Lambeth	Prior Littering	Smokers	Male	Female
I don't want to carry my litter anymore	10.00%	28.57%	12.50%	4.26%	18.75%	20.00%	10.00%	7.50%
There are no accessible litter bins	35.00%	42.86%	29.17%	36.17%	59.38%	50.00%	35.00%	30.00%
The litter bin was overflowing	26.25%	28.57%	25.00%	27.66%	34.38%	10.00%	26.25%	17.50%
The litter bin was exceedingly dirty or damaged	6.25%	0.00%	8.33%	8.51%	9.38%	0.00%	6.25%	7.50%
The area I'm in is already littered and one piece won't change anything	2.50%	7.14%	0.00%	2.13%	6.25%	10.00%	2.50%	0.00%
Nobody will see me doing it and I won't get caught	3.75%	7.14%	4.17%	2.13%	3.13%	10.00%	3.75%	2.50%
I don't see littering as a problem	1.25%	0.00%	0.00%	2.13%	0.00%	0.00%	1.25%	0.00%
Other	28.75%	35.71%	25.00%	31.91%	6.25%	30.00%	28.75%	30.00%

Where do you primarily see litter? Check all that apply (% agreeing)								
Where	Survey Average	Visitors	Residents	Employed in Lambeth	Prior Littering	Smokers	Male	Female
On the street or footway	90.00%	92.86%	87.50%	91.49%	87.50%	90.00%	90.00%	87.50%
In or around public transportation hubs	60.00%	78.57%	45.83%	61.70%	53.13%	70.00%	60.00%	60.00%
Near schools	21.25%	21.43%	20.83%	23.40%	3.13%	20.00%	21.25%	15.00%
Private property	16.25%	14.29%	20.83%	12.77%	12.50%	10.00%	16.25%	17.50%
Near restaurants or businesses	60.00%	78.57%	66.67%	57.45%	50.00%	80.00%	60.00%	65.00%
Recreational areas	57.50%	71.43%	66.67%	48.94%	56.25%	40.00%	57.50%	62.50%
Other	3.75%	7.14%	8.33%	0.00%	0.00%	0.00%	3.75%	7.50%

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What do you think are the most effective changes that Lambeth Council could make to reduce littering? Check all that apply (% agreeing)								
Recommendation	Survey Average	Visitors	Residents	Employed in Lambeth	Prior Littering	Smokers	Male	Female
Smaller fines	1.25%	0.00%	4.17%	0.00%	3.13%	0.00%	1.25%	0.00%
Larger fines	33.75%	21.43%	50.00%	31.91%	28.13%	10.00%	33.75%	30.00%
More litter bins	75.00%	85.71%	75.00%	68.09%	81.25%	80.00%	75.00%	87.50%
Fewer litter bins	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
More ashtrays	33.75%	28.57%	25.00%	38.30%	43.75%	70.00%	33.75%	30.00%
Public education	67.50%	57.14%	58.33%	74.47%	71.88%	60.00%	67.50%	65.00%
Advertisements	51.25%	35.71%	41.67%	59.57%	53.13%	50.00%	51.25%	52.50%
Public clean-up events	48.75%	21.43%	45.83%	55.32%	46.88%	50.00%	48.75%	45.00%
Other	17.50%	14.29%	29.17%	14.89%	15.63%	20.00%	17.50%	12.50%

On a scale from 1-5, rate how much you agree to the following statements. 1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree (average)								
Question	Survey Average	Visitors	Residents	Employed in Lambeth	Prior Littering	Smokers	Male	Female
I see too much litter in the borough	3.7949	4.1429	4	3.617	3.625	3.8	3.7949	3.5526
Littering is unacceptable	4.8375	4.7857	5	4.7872	4.5938	4.9	4.8375	4.825
Addressing littering is very important	4.5375	4.6429	4.7083	4.383	4.2813	4.5	4.5375	4.45
Littering is worse than it was two years ago	3.1538	3.6429	2.9545	3.1064	2.875	3	3.1538	3.3158
People litter because of lack of education about littering	3.4615	3.6923	3.6087	3.2553	3.4839	3.2	3.4615	3.4474
I would feel guilty if caught littering	4.7	4.7143	4.625	4.7234	4.4375	4.9	4.7	4.825
People litter because they don't think they'll be caught	3.9615	3.3077	4.0435	4.1064	4.2258	4.3	3.9615	3.9474
People litter because the fines for littering aren't high enough	3.0886	3.3571	3.1739	2.9149	2.8125	2.5	3.0886	3.2821
I support the recent increases in FPNs (Littering Fines) in the borough of Lambeth from 80 to 150	4.025	3.8571	4.375	3.8511	3.6875	4.1	4.025	3.925
If offered, I would participate in a community litter cleanup event on a weekend	3.1169	3.2857	3.5909	2.8261	2.6129	2.5	3.1169	2.9189

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When was the last time that you littered? (% agreeing)							
Frequency	Survey Average	Visitors	Residents	Employed in Lambeth	Smokers	Male	Female
Never	60.00%	50.00%	75.00%	57.45%	40.00%	60.00%	60.00%
Over a year ago	7.50%	14.29%	8.33%	4.26%	10.00%	7.50%	2.50%
Past Year	18.75%	14.29%	12.50%	21.28%	10.00%	18.75%	22.50%
Past Month	8.75%	7.14%	4.17%	10.64%	20.00%	8.75%	15.00%
Past Week	3.75%	7.14%	0.00%	6.38%	10.00%	3.75%	0.00%
Today	1.25%	7.14%	0.00%	0.00%	10.00%	1.25%	0.00%

Appendix F: Officer Interview Responses

First Officer Interview:

This first interview was conducted with one environmental enforcement officer on January 22, 2020 in the APCOA headquarters. Her responses are contained below:

1. Questions about the workings of their job

a. What do you look for when deciding where to set up and look for litterers?

- Places people congregate – doesn't mean litter (church), but train/tube stations with smoking passengers waiting – step out for a smoke – a lot of international offenders are from Hong Kong/China - aren't aware of the policies here even with zero tolerance policies at home.
- Waterloo because it's all business
- Only residential in specific cases where you know it's already happening (like someone specific)
- Night clubs – urinate outside, alcohol leads to this behavior
- Businesses (often shop workers or shop keepers come out for a quick smoke break and don't dispose of their butts properly)

b. How many FPNs would you estimate you give out in a day? In a week?

- No FPN quotas ("targets") are allowed by legislation; personal 7 minimum everyday – must be solid because they can't appeal an FPN, once it's cited it must be paid

c. How do people caught littering and issued FPNs typically react to this interaction?

- Don't think they commit an offence, think you're crazy, "no way I'm paying", find it hard to believe
- Sometimes aggressive
- 85% of FPNs are for cigarettes and people don't think this is an offence, second most is usually urination, followed by spitting

d. What is one of the most interesting stories you have from your job experience?

- Issued a woman in Stockwell, didn't care about the FPN, wanted to talk about her life problems – said "thank you I needed that" and gave her a hug
- A lot of people need someone to speak to – sounding board, sometimes apologize when they take out other problems on them

2. Questions about their experience of the littering demographics in Lambeth

a. Where do you typically observe the most litter?

- See 1.a

b. Is there a trend for time of day that you observe more litter?

- Early morning 6-8:30 rush hour/train stations, 4-5:30/5-7 train passengers
 - Most tube stations are only worth patrolling during these peak hours
- At business places and built-up residences start at 9
- Waterloo any time (high turnover of people, especially international)

c. Is there a certain demographic of people you observe littering/issue FPNs to more often than others? (gender, approximate age, activities [smoking, eating, etc.], resident or visitor to borough, etc.)

- Men (specifically white British males, "IC1 males"), white Europeans smoke a

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lot, hardly ever black/mixed race but the hardest to enforce - already have a chip on their shoulders and come back with “it’s because I’m black”

- Smokers and commuters
- d. What types of litter do you most often see and cite FPNs for?**
 - Cigarette litter far and away #1, public urination, spitting, dog fouling
 - Questions about their opinions of FPN effectiveness
- e. Do you tend to see repeat offenders after receiving an FPN?**
 - Yes, one person 5 times in a month during training; lower repeat offenders in boroughs where repeat offenders go to court (follow the procedures); no correlation of more fines to lower littering rates
 - No central database so there is no way to track repeat offenders
- f. Do you think the Council’s FPN policy and pricing has effectively reduced littering behavior in Lambeth?**
 - No, nothing – it’s a habit, ingrained in people, very hard to break, painful to pay but doesn’t deter many
- g. Are there any other methods you have considered that might be more effective in achieving this goal?**
 - Catching people before they drop it - “this is who I am, don’t drop it”, a lot feel you’re patronizing them though; people need someone in their life to tell them/help them change the habit
 - This could put officers in danger
 - Giving officers police powers/being with the police – threat of persecution and detainment is stronger

Second Officer Interview:

This next interview was conducted with a group of 3 environmental enforcement officers while observing them outside of a Brixton Station on January 22, 2020. Their responses to our questions are below:

- 1. Questions about the workings of their job**
 - a. What do you look for when deciding where to set up and look for litterers?**
 - Set route, come down Brixton Hill 8/8:15 for rush hour time
 - Vauxhall
 - Between underground and train stations is big (1-minute walk between), outside Starbucks – even though there’s 4 bins
 - b. How many FPNs would you estimate you give out in a day? In a week?**
 - Team is getting bigger, in different areas, and it differs
 - 5-6 in Brixton, 7-10 in Waterloo, similar but maybe less in Vauxhall
 - The number of FPNs that are given out in a day varies based on where officers are located
 - Highest number in Waterloo and Vauxhall followed by Brixton.
 - Waterloo – ticket every 20-30 min for a total of 7-10 per day
 - Vauxhall - similar to Waterloo maybe a little less
 - Brixton – ticket every 30-40 min for a total of around 5-6 per day

- c. **How do people caught littering and issued FPNs typically react to this interaction?**
 - Varies, some “only £100? Fine no problem”
 - Some fight back a little with “Can’t I just pick it up” and the answer is “well if I didn’t catch you would you have picked it up?” and they usually comply then
 - Some people shake it off with little care
 - Lots of frustration and embarrassment due to public nature of stops
 - Don't accept the responsibility, have to explain the offence is littering not smoking
 - d. **What is one of the most interesting stories you have from your job experience?**
 - Nothing stands out
2. **Questions about their experience of the littering demographics in Lambeth**
 - a. **Where do you typically observe the most litter?**
 - Outside stations like Brixton, Vauxhall, and Waterloo
 - Is there a trend for time of day that you observe more litter?
 - 7-10:30
 - Biggest times are morning and afternoon rush as well as lunchtime
 - b. **Is there a certain demographic of people you observe littering/issue FPNs to more often than others? (gender, approximate age, activities [smoking, eating, etc.], resident or visitor to borough, etc.)**
 - Smokers and commuters
 - c. **What types of litter do you most often see and cite FPNs for?**
 - Less often actual rubbish – mostly just cigarettes, people don’t realize It’s on the bins
 - Cigarette butts, dog fouling, urination, spitting
3. **Questions about their opinions of FPN effectiveness**
 - a. **Do you tend to see repeat offenders after receiving an FPN?**
 - Personally, never had same twice
 - People that have been caught make an effort to use the bins next time at least when officers are around.
 - Not too many
 - b. **Do you think the Council’s FPN policy and pricing has effectively reduced littering behavior in Lambeth?**
 - Shock is the first reaction, ignorance/don’t want to learn and still repeat offenders
 - c. **Are there any other methods you have considered that might be more effective in achieving this goal?**
 - More signs - get complaints about no signs around that say it
 - But also brings up the “I didn’t see the sign” argument

The final interview was conducted with a group of two environmental enforcement officers inside the APCOA headquarters on January 24, 2020. Their interview responses are below:

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1. Questions about the workings of their job

a. What do you look for when deciding where to set up and look for litterers?

- Footfall/activity increases chance of committing an offence
- People congregate, figure out who of that group is likely to offend
- Get to quiet areas too (give cautions and warnings) to get them aware/comfortable of them and the policy
- One team does patrols in one area then goes to another area
- They have a map of locations with high noncompliance
- Officers aren't waiting in bushes – they are in plain view. The moment they see an individual take 3 steps away from their litter they can issue a citation
- How many FPNs would you estimate you give out in a day? In a week?
- Unpredictable, depends on the area and the day – could be 3, 12, 15, 2, you never know

b. How do people caught littering and issued FPNs typically react to this interaction?

- Varies, unpredictable, depends how you approach them
- Some taunting now
- Depends on person's attitude and background too (history with authority?)
 - Depends on the level of education in individuals we approach. This area used to have a lot of crime and the people have bad experiences with the police
- Some aggressive, some passive naturally
- A lot of diversity in reaction, personality, wealth, and attitude in Lambeth
- Usually good until they hear the amount
- People are anti-uniform; they don't like when you come up to them in a full uniform and do not identify yourself as a police officer.
 - Some stranger told a guy who was being issued an FPN to leave instead of complying with the officer
 - Some people know EEOs aren't police and can't force compliance
- Some people exercise their right to walk away

c. What is one of the most interesting stories you have from your job experience?

- Most of them are okay until you tell them how much they have to pay

2. Questions about their experience of the littering demographics in Lambeth

a. Where do you typically observe the most litter?

- Train stations, restaurants (consumption of food/coffee)

b. Is there a trend for time of day that you observe more litter?

- Rush hours (7-10), lunchtime, evening rush hour – people using transport. Fridays have higher traffic

c. Is there a certain demographic of people you observe littering/issue FPNs to more often than others? (gender, approximate age, activities [smoking, eating, etc.], resident or visitor to borough, etc.)

- Smokers and commuters

d. What types of litter do you most often see and cite FPNs for?

- Cigarette butts – public don't think of it as litter – need it explained/broken down to understand
- Spitting – same as above, don't understand its littering

3. Questions about their opinions of FPN effectiveness

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- a. **Do you tend to see repeat offenders after receiving an FPN?**
 - Yes, very often – reason for the fine increase
 - Usually months apart. They find out that they are repeat offenders by asking if they've been cited before
 - Always asks if they have been stopped before by an officer
- b. **Do you think the Council's FPN policy and pricing has effectively reduced littering behavior in Lambeth?**
 - Yes definitely – unless you're silly and have money why would you do it?
 - High value area (Lambeth), have to be well-to-do to live here
 - Mention max penalty of £2,500
 - Balance between when to issue a warning vs FPN
- c. **Are there any other methods you have considered that might be more effective in achieving this goal?**
 - More signs, can't do too many bins

Appendix G: Officer Interview Responses Coded

	First Officer	Group of 3 Officers	Group of 2 Officers	Trends
1a) What do you look for when setting up?	Congregation, Underground stations, Waterloo Station, sometimes residential areas, night clubs, businesses	The officers have set routes, Vauxhall between train and Underground stations is a popular location	Footfall, congregation, quiet areas specifically to spread awareness, they contain a map of locations of high noncompliance	Tube Station - 6/6, Congregation - 6/6
1b) How many FPNs?	No quotas allowed, personal 7 minimum (but can't appeal)	5-6 Brixton, 7-10 Waterloo, similar in Vauxhall but slightly less, varies by location	Unpredictable, depends on time of day and location	Varies, Non-Consistent - 6/6
1c) Reactions	They don't think they are committing an offence, sometimes the people react aggressively, some people don't think cigarette butts in particular are an offence, Surprised by the cost	Reactions vary, some don't care, some fight back a little, most show frustration, embarrassment, don't accept responsibility, Surprised by the cost	Reaction vary, unpredictable, surprised by cost, depends on approach, some taunt, depends on level of education, some aggressive, some passive naturally, people are anti-uniform, good until they hear the amount, some execute right to walk away	Varies, No Definitive Answer - 6/6, Frustration, Surprised by cost - 6/6, embarrassment, usually comply with a good attitude and explanation of the error, but also usually don't even understand the offence
1d) Stories	A woman in Stockwell just wanted to vent about personal problems, said she needed this and gave a hug			
2a) Where do you observe most?	Train/tube stations, Waterloo, night clubs, businesses, places of congregation		Train stations, restaurants (consumption of food/coffee)	Tube Station - 6/6, Congregation - 6/6
2b) Time of day	Morning rush hour, lunch, afternoon rush hour	Morning rush hour, lunch, afternoon rush hour	Morning rush hour, lunch, afternoon rush hour	Rush Hours and Lunch - 6/6
2c) Demographics	Smokers, commuters, shopkeepers, sometimes residents in the residential areas, men	Smokers, commuters,	Smokers, commuters	Smokers, commuters - 6/6

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2d) Types of litter most often seen/cited	Majority Cigarette Litter, public urination, spitting and dog fouling	Mainly Cigarette Litter, public urination, spitting and dog fouling	Majority Cigarette Litter (People do not see it as littering), and spitting	Cigarettes and Spitting - 6/6, Public Urination and Dog Fouling 4/6
3a) Repeat offenders	Yes	No- People who are fined try to use bins	Yes - People forget after about a month and commit again	Yes - 3/6, No - 3/6 ("yes" responses were pretty emphatic)
3b) Increase of FPN effectiveness	No - It is a hard habit to break	No	Yes - Some people do not care, but that may be because a lot of rich people move through Lambeth	No - 4/6, Yes 2/6
3c) Other methods	Officers need police power or presence, threat of criminal record, airtight pouch with foil costs £1, catch people before they drop it	More signs, but also "I didn't see the sign" argument	More signs	More Signs 5/6, One stated Police Power, changing the ashtray design, mentioning max penalty

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Appendix H: Baseline Litter Counts

Brixton Tube Station Tuesday January 28, 2020 08:30 - 09:30			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	64	87.67%	74.42%
Bin Interaction with Improper Disposal	9	12.33%	10.47%
Total Litter Bin Interactions	73	100.00%	84.88%
Improper Disposal (Cigarettes Littered on Ground)	13	59.09%	15.12%
Improper Disposal (Cigarette Ashed and Left on Bin)	9	40.91%	10.47%
Total Improperly Disposed of Cigarettes	22	100.00%	25.58%
Total Cigarettes Counted	86	100.00%	100.00%

Brixton Tube Station Tuesday January 28, 2019 11:52 - 12:52			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	23	74.19%	54.76%
Bin Interaction with Improper Disposal	8	25.81%	19.05%
Total Litter Bin Interactions	31	100.00%	73.81%
Improper Disposal (Cigarettes Littered on Ground)	11	57.89%	26.19%
Improper Disposal (Cigarette Ashed and Left on Bin)	8	42.11%	19.05%
Total Improperly Disposed of Cigarettes	19	100.00%	45.24%
Total Cigarettes Counted	42	100.00%	100.00%

Waterloo Station Wednesday January 29, 2020 9:05 - 10:05			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	27	72.97%	49.09%
Bin Interaction with Improper Disposal	10	27.03%	18.18%
Total Litter Bin Interactions	37	100.00%	67.27%
Improper Disposal (Cigarettes Littered on Ground)	18	64.29%	32.73%
Improper Disposal (Cigarette Ashed and Left on Bin)	10	35.71%	18.18%
Total Improperly Disposed of Cigarettes	28	100.00%	50.91%
Total Cigarettes Counted	55	100.00%	100.00%

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Waterloo Station Wednesday January 29, 2020 12:39 - 13:39			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	24	88.89%	60.00%
Bin Interaction with Improper Disposal	3	11.11%	7.50%
Total Litter Bin Interactions	27	100.00%	67.50%
Improper Disposal (Cigarettes Littered on Ground)	13	81.25%	32.50%
Improper Disposal (Cigarette Ashed and Left on Bin)	3	18.75%	7.50%
Total Improperly Disposed of Cigarettes	16	100.00%	40.00%
Total Cigarettes Counted	40	100.00%	100.00%
Vauxhall Station Thursday January 30, 2020 8:30 - 9:30			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	27	67.50%	58.70%
Bin Interaction with Improper Disposal	13	32.50%	28.26%
Total Litter Bin Interactions	40	100.00%	86.96%
Improper Disposal (Cigarettes Littered on Ground)	6	31.58%	13.04%
Improper Disposal (Cigarette Ashed and Left on Bin)	13	68.42%	28.26%
Total Improperly Disposed of Cigarettes	19	100.00%	41.30%
Total Cigarettes Counted	46	100.00%	100.00%
Vauxhall Station Thursday January 30, 2020 12:22 - 13:22			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	16	72.73%	53.33%
Bin Interaction with Improper Disposal	6	27.27%	20.00%
Total Litter Bin Interactions	22	100.00%	73.33%
Improper Disposal (Cigarettes Littered on Ground)	8	57.14%	26.67%
Improper Disposal (Cigarette Ashed and Left on Bin)	6	42.86%	20.00%
Total Improperly Disposed of Cigarettes	14	100.00%	46.67%
Total Cigarettes Counted	30	100.00%	100.00%

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Appendix I: Post-Campaign Litter Counts

Brixton Tube Station Tuesday February 18, 2020 11:47 - 12:47			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	27	90.00%	81.82%
Bin Interaction with Improper Disposal	3	10.00%	9.09%
Total Litter Bin Interactions	30	100.00%	90.91%
Improper Disposal (Cigarettes Littered on Ground)	3	50.00%	9.09%
Improper Disposal (Cigarette Ashed and Left on Bin)	3	50.00%	9.09%
Total Improperly Disposed of Cigarettes	6	100.00%	18.18%
Total Cigarettes Counted	33	100.00%	100.00%

Waterloo Station Wednesday February 19, 2020 9:00 - 10:00			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	27	93.10%	75.00%
Bin Interaction with Improper Disposal	2	6.90%	5.56%
Total Litter Bin Interactions	29	100.00%	80.56%
Improper Disposal (Cigarettes Littered on Ground)	7	77.78%	19.44%
Improper Disposal (Cigarette Ashed and Left on Bin)	2	22.22%	5.56%
Total Improperly Disposed of Cigarettes	9	100.00%	25.00%
Total Cigarettes Counted	36	100.00%	100.00%

Waterloo Station Wednesday February 19, 2020 12:28-13:28 (Light Rain)			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	28	84.85%	62.22%
Bin Interaction with Improper Disposal	5	15.15%	11.11%
Total Litter Bin Interactions	33	100.00%	73.33%
Improper Disposal (Cigarettes Littered on Ground)	12	70.59%	26.67%
Improper Disposal (Cigarette Ashed and Left on Bin)	5	29.41%	11.11%
Total Improperly Disposed of Cigarettes	17	100.00%	37.78%
Total Cigarettes Counted	45	100.00%	100.00%

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Vauxhall Station Thursday February 20, 2020 12:13 - 1:13 (Light Rain transitioning to Heavy Rain)			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	31	86.11%	73.81%
Bin Interaction with Improper Disposal	5	13.89%	11.90%
Total Litter Bin Interactions	36	100.00%	85.71%
Improper Disposal (Cigarettes Littered on Ground)	6	54.55%	14.29%
Improper Disposal (Cigarette Ashed and Left on Bin)	5	45.45%	11.90%
Total Improperly Disposed of Cigarettes	11	100.00%	26.19%
Total Cigarettes Counted	42	100.00%	100.00%

Vauxhall Station Thursday February 20, 2020 8:27 - 9:27			
	Number of Cigarette Butts Counted	Percentages Based on Partial Totals	Percentages Based on Total Cigarettes Counted
Bin Interaction with Proper Cigarette Disposal	22	78.57%	73.33%
Bin Interaction with Improper Disposal	6	21.43%	20.00%
Total Litter Bin Interactions	28	100.00%	93.33%
Improper Disposal (Cigarettes Littered on Ground)	2	25.00%	6.67%
Improper Disposal (Cigarette Ashed and Left on Bin)	6	75.00%	20.00%
Total Improperly Disposed of Cigarettes	8	100.00%	26.67%
Total Cigarettes Counted	30	100.00%	100.00%