Dockless Vehicle Sharing Demonstration

Phase I Evaluation **December 2018**

GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

Table of Contents

1.0 Active Transportation in Washington, D.C.	4
2.0 The Dockless Bikeshare Demonstration	11
3.0 Evaluation Methodology	13
4.0 Findings	17
4.1 Addressing Active Transportation Goals	18
4.2 Ensuring a Safe Transportation System	27
4.3 Public Feedback	32
5.0 Recommendations and Next Steps	36

MESSAGE FROM MAYOR MURIEL BOWSER

From car-sharing and app-based ride-hailing services, to launching the first large-scale modern bikesharing system in the United States, Washington, DC has long been an early adopter of new transportation technology. In September 2017, we embarked on a bold experiment: the initiation of a demonstration period in which the DC government would permit private companies to operate dockless bicycle and electric scooter-sharing services on our public streets. These services allow Washingtonians and visitors to rent bikes or e-scooters for short trips, usually through a smartphone app. Our goal was to see if the new technologies offered by these companies would expand the reach of sustainable mobility to new riders and more neighborhoods.

The technology to offer dockless mobility services only came about recently, with only a limited track record of operations in other cities. In cities around the world, the lack of a carefully considered regulatory approach led to widespread clutter on streets and sidewalks as companies deployed their fleets with little regard for the impacts that pedestrians might experience. In fact, our residents had many questions about the costs and benefits of this new technology. Our demonstration period sought to answer a number of questions: Could people be trusted to use these new devices safely? How would the competition for customers impact Capital Bikeshare and other established modes of transportation? Would dockless companies increase mobility options for low-income residents and the unbanked?

We could have chosen to ignore these questions, and to view things that are new and different as a threat to the established way of conducting business. But here in DC, we are a leader in innovation, always looking for new ideas and new tools that can make our city safer, stronger, and more resilient for all who live, work, and visit.

Because there is still so much to learn, and because dockless vehicle technology offers so many potential benefits for Washington, DC, we are continuing the dockless program into 2019—and we will continue to evaluate its performance and share results. As we move forward, the input received from Washingtonians is essential to understanding how these services can improve navigating around town, where improvements are needed, and how dockless bikes and scooters fit into our broader goals to build a healthier, more sustainable city with more choices for all.

I encourage you to tell us what you think about the dockless program and how we can make it better by dropping us a line at dockless.bikeshare@dc.gov. Let's keep pushing!

GOVERNMENT OF THE
DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

1.0 Active Transportation in Washington, D.C.

All urban trips start and end with walking. Active transportation, movement through physical activity, is the lifeblood of any urban area's transportation system. In order to efficiently, safely, and sustainably move large numbers of people in tight spaces, city streets must promote walking and the use of bicycles and other alternatives to private motor vehicles. Along with public transit, active transportation is the best way to provide people in cities with the freedom of movement and access to the places and services they need to thrive. The District of Columbia has committed to active transportation goals as part of several initiatives and programs.

Sustainable DC is the District's plan to be the healthiest, greenest, and most livable city in the United States. By the year 2032, the plan aims to increase biking and walking trips to 25 percent of all commuter trips.

moveDC, the District of Columbia's Multimodal Long-Range Transportation Plan, envisions a world-class transportation system serving the people who live, work, and visit the city. The planned transportation system will make the city more livable, sustainable, prosperous, and attractive. It will offer everyone in the District exceptional travel choices. moveDC also targets a goal of 75 percent of commute trips by non-auto modes by 2040.

The 2015 Capital Bikeshare development plan sets a goal that 65 percent of DC residents, 90 percent of DC employees, and 97 percent of all transit boardings are within one-quarter mile from a Capital Bikeshare station. The expansion of Capital Bikeshare detailed in the development plan will be completed in early 2019.

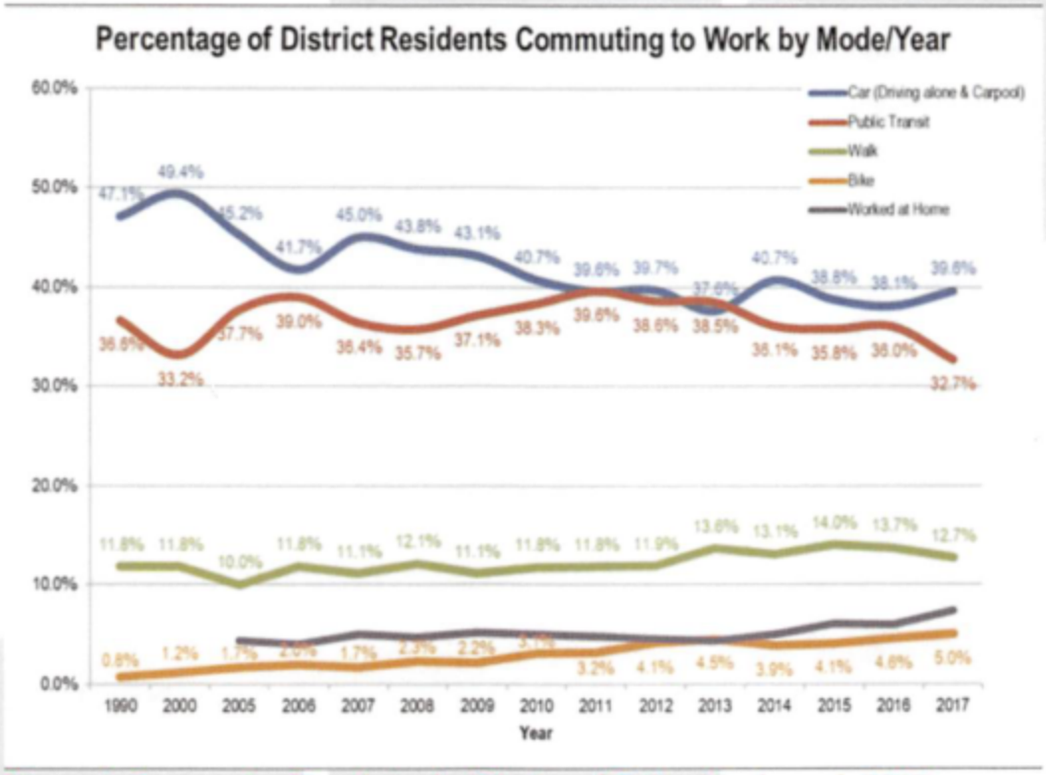


Figure 1: Commuting Trends in the District of Columbia through 2017

The District Department of Transportation (DDOT) has encouraged the growth of bicycling in the District through various education initiatives, incentives, Transportation Demand Management, installation of bicycle parking, and the construction of a network of on-street bicycle facilities. In 2000, fewer than three miles of bike lanes existed in the District. Today, there are more than 80 miles of bike lanes, more than 60 miles of trails, and over 3,000 public bike racks. The moveDC plan calls for a bicycle network totaling 136 miles of bike lanes, 72 miles of protected bike lanes (cycle tracks), and 135 miles of trails by 2040.

DDOT has a history of promoting, piloting, and permitting various models of shared mobility to improve the transportation system, and reduce single occupancy motor-vehicle trips and car ownership. Early examples include the permitting of on-street parking spaces for private carsharing companies, and regulation of point-to-point carsharing

Bikeshare offers an active transportation option that is more affordable and more convenient than personal bicycle ownership for many residents of the region. As the District invests in the expansion of the Capital Bikeshare system, to ensure that it is as physically and financially accessible to as many residents and visitors as possible, significant investment, planning, and management is required. From the customer's perspective, the primary challenges of using Capital Bikeshare are the proximity of docking stations to the origin of a trip, the availability of bicycles to rent, the availability of empty station docks at the end of a trip, and the proximity of docking stations to the trip destination.

DDOT remains committed to the expansion of Capital Bikeshare, arguably the most successful bikeshare program in the country. The District of Columbia owns the assets of the Capital Bikeshare program (bikeshare stations and bicycles) and jointly contracts with a private company to operate, maintain, and rebalance the system in conjunction with other regional jurisdictions. All revenues generated by the program within the District are used to operate the District's portion of the system. The District must invest in the assets it owns, many of which are approaching an average age of seven years. When expanding the system, DDOT conducts significant community outreach and public engagement prior to installing a new bikeshare station, working with Advisory Neighborhood Commissions and adjacent users to identify optimal locations.

In the summer of 2017, DDOT received inquiries from operators of private free-floating, non-station-based, or "dockless" bikeshare systems. In theory, the dockless approach to bikeshare may offer an opportunity to supplement station-based bikeshare. Additionally, this approach does not require the capital expense of a public bikeshare system or upfront operating costs. Private dockless operators may foster more competition and innovation, which may lead to a higher quality service. Users also do not have to consider the availability of a docking station at the trip destination. Depending on the technology employed, dockless bikeshare may offer municipalities ridership data that Capital Bikeshare does not produce, which can benefit transportation planning in general. Without being confined to stations, dockless bikeshare may be able to accommodate adaptive vehicles for people with disabilities.

The dockless bikeshare demonstration offered the potential to test the efficacy of new programs through the following questions:

- Could the systemic challenges of maintaining operations to ensure the availability of docks and bikes be mitigated if a bikeshare system is not station-based?
- Would the dockless approach to the service improve accessibility and mobility?
- Could the potential negative impacts of dockless bikeshare on the use of public space be mitigated?
- Would the dockless service approach improve accessibility and mobility?

While DDOT had several templates for shared mobility to apply to the dockless version of bikeshare, no regulatory framework existed to guide or prohibit private companies from operating in the District. Global changes to technology and infrastructure have had effects on emerging transportation systems. The market has an appetite for new transportation options. Cities are taking a variety of approaches in response to dockless bikes and scooters. Some are permitting multiple operators, some are opting to procure and contract with a single operator, some are working with or around an existing municipal bikeshare system, and some are prohibiting operations all together.

In the District, as of September 2017, the most relevant policy and regulatory framework that could govern dockless bikeshare operations was codified in the District of Columbia Municipal Regulations, Title 18 – Vehicles and Traffic, and Title 24 – Public Space and Safety:

- **Title 24 Section 24-111.1** No person shall leave any goods, wares, or merchandise either in or upon any street, avenue, alley, highway, footway, sidewalk, parking, or other public space in the District for a period longer than two (2) hours, except as provided in this chapter or in chapter 2 of this title.
- **Title 18 Section 1209.1** A person may secure a bicycle to a stanchion for a period of not more than twelve (12) consecutive hours, by means of a lock or similar device, in accordance with the requirements of § 1209.2.
- **Title 18 Section 1209.2** A person may secure a bicycle to a stanchion by means of a lock or similar device as long as securing the bicycle does not obstruct or unduly impede traffic or pedestrian movement and as long as securing bicycles has not been forbidden by any notice posted by the Director.

DDOT chose to conduct a dockless demonstration program in order to determine what new regulations, if any, would be necessary to maximize the benefit to the public and minimize the potential unintended consequences of this new form of shared mobility.

2.0 The Dockless Bikeshare Demonstration

DDOT's dockless demonstration was designed to provide the opportunity to observe a new form of shared mobility and its potential advantages, while managing competing demands for public space and prioritizing public interest. The first phase of the demonstration began in September 2017 and operated through April 2018. This initial period was extended to August 2018 after showing promising but inconclusive results.

DDOT issued operators in the program Public Right-Of-Way Occupancy Permits (PROW- OPs), with accompanying terms and conditions that detailed the rules of the program. Operators were limited to 400 vehicles each, were required to provide public data and monthly reports to DDOT, and were not charged a fee to operate. DDOT reiterated existing regulations regarding where each vehicle could be legally parked and operated. At the program's peak, seven companies participated. Mobike, Lime, Spin, and Ofo operated traditional pedal bicycles. JUMP operated motorized or electric-assist bicycles. Skip, Bird, and Lime operated electric scooters (defined as "personal mobility devices" in the District). From September 2017 through June 2018, the dockless demonstration resulted in over 625,000 dockless trips by riders with approximately 233,700 unique user accounts among the seven companies.

Over the course of the demonstration, DDOT implemented a program to collect and analyze data to inform some of the central program considerations. These considerations were:

Size of Program

Operators – DDOT chose to initially allow an open permit system, where operators could demonstrate eligibility and participate in the program once permitted. DDOT weighed the advantages and disadvantages of constraining the program to a limited number of operators versus an open system with greater competition. The number of operators and the pilot style of the demonstration informed the decision to use permits instead of contracting with operators.

Fleet – During the demonstration of a rapidly developing technology, DDOT chose to limit each operator to 400 vehicles, to prevent oversaturation experienced in other markets, to allow for multiple operators, and to ensure operators could maintain safe vehicle fleets.

Program Operations

Fleet Distribution – DDOT required operators to serve the whole District, and to make vehicles available to rent in all eight wards.

Cost of Operations – During the demonstration, operators were not charged permit fees.

Enforcement – During the demonstration, DDOT lacked an enforcement mechanism to deter improper parking, vehicle safety defects, etc., short of revoking an operator's permit. DDOT relied on close collaboration with operators, education of users, and operators' own incentive and disincentive strategies for customers.

Public Space Management

Designated Parking Areas – DDOT intended to observe the need for required or reserved locations for parking of dockless vehicles in public space. These could be virtually defined areas that use geo-fencing in smartphone applications, areas on the sidewalk that use pavement markings, in-street corals, or simply more abundant bicycle racks. DDOT required operators to avoid overconcentration of bicycles in any one location.

Wheel-lock Vs. Lock-to – DDOT did not require that dockless vehicles lock to a stanchion or piece of street infrastructure when not in use. Rather, DDOT intended to observe the opportunities and challenges associated with each approach.

Program Evaluation

Data and Transparency – Operators were required to provide a public Application Programming Interface (API), which would display real-time location of vehicles available to rent, as well as monthly reports to DDOT detailing extensive anonymized trip data.

3.0 Evaluation Methodology

DDOT has evaluated the current demonstration program and its performance in relation to DDOT goals by analyzing data received from participating companies, Capital Bikeshare system data, DDOT field observations, direct communications with both participating and interested companies, and public comment.

There are many questions surrounding dockless vehicle sharing in the District that can inform future decisions on the program. DDOT identified specific research questions to be tracked throughout the course of the demonstration. Each question provides insight into the utility of the program in several key ways:

Addressing active transportation goals

- Will the dockless approach, with greater flexibility of trip origins and destinations, address customer demand and expand the geographic reach of bikeshare?
- How will dockless trips differ from Capital Bikeshare trips in terms of location and usage? How do ridership patterns differ for different vehicles (e-bikes, scooters, pedal bikes, Capital Bikeshare)?

Ensuring a safe transportation system

- Will dockless operators maintain a state of good repair with a safe fleet of vehicles, without safety defects, vandalism, and theft?
- Will dockless users abide by parking rules and park vehicles in safe locations in public space only on District of Columbia right of way?

Public Input

- How will people who live, work, and visit the District respond to dockless bikeshare and will impressions change over time?
- What will be the most pressing concerns of the community?

Managing bikesharing for the District

- What are the most effective approaches to managing and operating a dockless bikeshare system for the District, in terms of contracting, procurement, public-private-partnerships, etc.?
- Will the demonstration affect Capital Bikeshare ridership and revenue? If so, to what extent?

The demonstration period evaluation did not answer all of these questions, but it provided insight on the performance of the program and established a baseline for future evaluation.

Collaborative Evaluation

To assist in the task of evaluating the demonstration, DDOT collaborated with The Lab @ DC in the Executive Office of the Mayor, academic partners at Georgetown University, The George Washington University, and Virginia Tech. These groups supported DDOT's efforts in data cleaning, data analysis, and surveying, Impact on Capital Bikeshare, biking in the District, and public space. DDOT also partnered on several research projects from area universities to tackle questions on the interaction of dockless and Capital Bikeshare (Georgetown), parking behavior and public feedback (The George Washington University), and demographic characteristics of users and geographic reach of dockless services (Virginia Tech). DDOT also partnered on several research projects from area universities to tackle questions on the interaction of dockless and Capital Bikeshare (Georgetown), parking behavior and public feedback (The George Washington University), and demographic characteristics of users and geographic reach of dockless services (Virginia Tech).

Public Input

Data has the potential to answer some of DDOT's critical questions on the demonstration but public feedback is essential in understanding how the program functioned over the pilot period. DDOT engaged with a range of stakeholders during the demonstration. DDOT participated in a Town Hall meeting in Ward 2 on December 5, 2017 to discuss the permit requirements and pilot program. DDOT also participated in an ANC Open House on May 10, 2018 sponsored by DC Sustainable Transportation to gather feedback from elected commissioners from across the District. DDOT continues to participate in regular meetings with federal agencies and the business community through DC Sustainable Transportation, which includes Business Improvement Districts. DDOT has attended multiple ANC meetings on invitation to explain the program and seek feedback. DDOT also conducted an online survey for both users of dockless vehicle services and the general public. The survey was open for two months from May to July 2018. The survey asked about the frequency and reasons for using dockless bikeshare, impressions on the size of the program and the quality, safety, and condition of the service, and finally, suggestions to improve the program.

Other efforts

In addition to data reported monthly from the companies, DDOT conducted a field audit. Over two weeks in July 2018, more than 180 individual field inspections of parked dockless vehicles were completed. This effort helped to validate data and public feedback on the state of dockless vehicle parking and the physical condition of dockless vehicles.

In accordance with the permit terms and conditions, companies were required to provide a public API. DDOT welcomed those interested in conducting their own research to access the API and share their findings, apps, methodologies, etc. in informal sessions. The Transportation Techies, hosted by Mobility Lab, has had several bike hack nights to present research on docked and dockless bikeshares.

4.0 Findings

The findings presented in this section of the report reflect the initial analysis of the pilot period from September 2017 through June 2018 and begin to provide data-based support for future decisions about a potential longer-term dockless vehicle share program. Much of the data used for this evaluation was collected as a stipulation of the permit.

Companies were required to provide DDOT anonymized trip-level data but there were initial challenges in standardizing the data and getting complete data from all companies. Data compliance issues made it difficult to gauge the performance of the program at times and have highlighted that full and complete data is crucial. Companies that do not provide complete data hinder the management of the program. The city of Los Angeles is developing a Mobility Data Specification (MDS) that could be used to set a standard set of data reporting requirements across jurisdictions.

DDOT is actively exploring working with Los Angeles and other partner cities to utilize the MDS as a common standard for dockless bikes and scooters and potentially other shared mobility services.

4.1 Addressing Active Transportation Goals

To gain an understanding of how the program was received and if it was effective, the performance measure of ridership was assessed. This showed how many trips were taken on dockless vehicles during the pilot period. Ridership varied over the course of the demonstration.

Weather affects both the dockless vehicles and Capital Bikeshare usage. The total number of trips per vehicle per day increased with the introduction of scooters. Figure 2 helps to answer the question, "how did the program perform over time?"

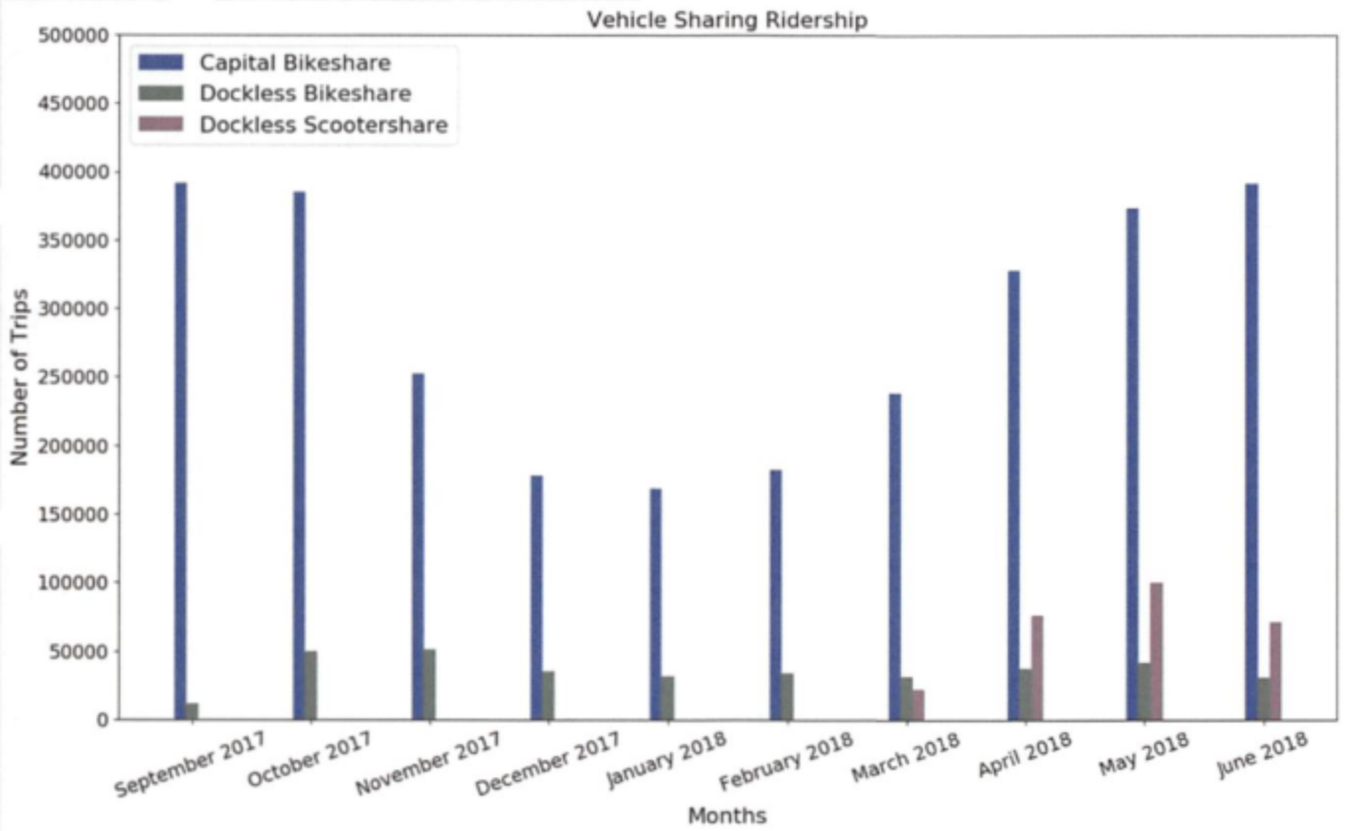
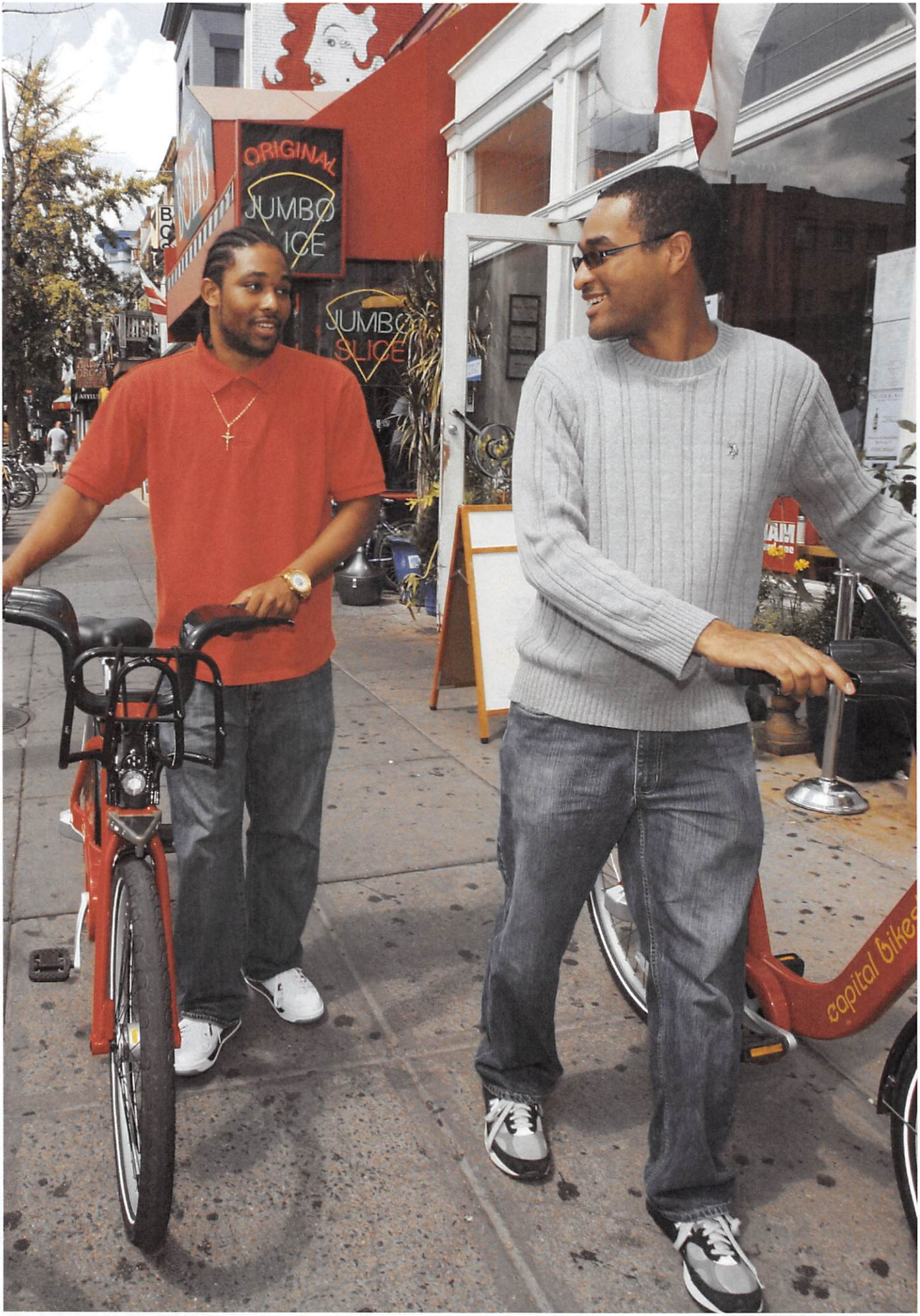
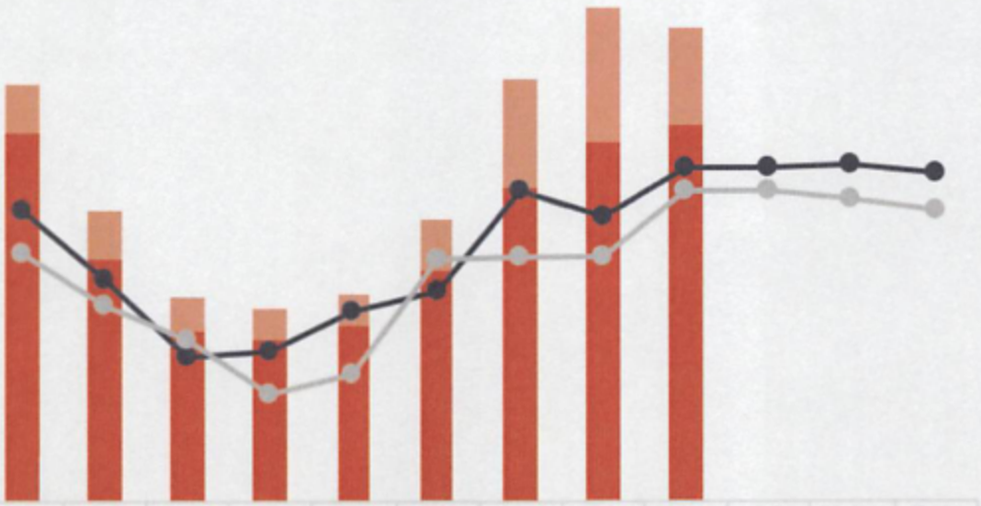


Figure 2: Dockless bikeshare trips during the demonstration period. Bicycles saw steady usage across fall months with a decrease across the winter months. The number of trips increased dramatically in spring 2018 with the introduction of scooters.


ORIGINAL
JUMBO
ICE
JUMBO
SLICE
capital bikes

Impact on Capital Bikeshare

Capital Bikeshare has been supporting active transportation in the District for nearly a decade and one of the biggest questions for DDOT was "how will dockless bikesharing impact Capital Bikeshare?" Analysis of the demonstration does not conclusively suggest that the current size and scale of the dockless demonstration program has strongly impacted Capital Bikeshare ridership and revenue. Figure 3 compares Capital Bikeshare ridership to the ridership in the pilot period. The graph also shows an additive effect of dockless vehicles.



	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
FY 2018 Dockless Bikeshare	49,974	51,347	35,104	31,402	33,795	54,087	113,571	142,189	102,675			
FY 2018 CaBi (269 stations)	385,389	252,825	178,084	168,791	182,555	239,130	328,550	373,805	391,740			
FY 2017 CaBi (264 stations)	302,855	229,820	150,176	155,058	199,501	218,069	323,948	297,707	348,482	348,576	352,497	342,118
FY 2016 CaBi (233 stations)	257,640	203,965	168,217	111,823	131,294	252,647	254,216	256,278	324,978	324,762	315,877	303,898

Figure 3 Comparison of bikeshare ridership trends during the demonstration period in relation to previous years. During the demonstration, dockless ridership appears to be additive to Capital Bikeshare and has increased overall bikeshare ridership in comparison to 2017 and 2016.

An additional performance measure for the demonstration program looked at how many trips were completed and the number of trips completed on average per vehicle. Table 1 summarizes the number of unique trips per vehicle reported for all operators and the average number of trips each vehicle took per day.

Table 1 Summary Table of Performance for Dockless Demonstration Period

	Trip Count		User Count†	Average Trips per Vehicle Per Day	
	Dockless	CaBi	Dockless	Dockless	CaBi
2017 September	11,817	392,041	5,987	2.33	4.52
2017 October	49,974	385,389	20,620	2.36	4.43
2017 November	51,347	252,825	19,312	1.81	3.06
2017 December	35,104	178,084	13,720	1.35	2.21
2018 January	31,402	168,791	11,179	1.37	2.18
2018 February	33,795	182,555	11,491	1.49	2.42
2018 March	54,087	239,130	20,651*	2.27	2.71
2018 April	113,571	328,550	31,917*	2.87	3.52
2018 May	142,189	373,805	55,442	2.94	3.89
2018 June	102,675*	391,740	43,408*	3.14*	4.21

* Missing data from one or more operators

The dynamics of the current dockless demonstration and its effect on ridership and revenue loss to Capital Bikeshare are still developing, but DDOT has observed impacts on Capital Bikeshare operations. Capital Bikeshare is experiencing greater confusion among riders regarding the requirement to end a trip by docking a bicycle at a station. During Capital Bikeshare's seven years of operations, prior to the dockless demonstration, a total of 61 bicycles were lost (that is, not returned). Since the launch of the dockless demonstration program in September 2018, 126 bicycles have been lost.

Geographic distribution of dockless trips

A critical question DDOT wanted to answer was "where are dockless trips going?" This question helps DDOT understand where there are transportation opportunities. Figure 4 shows the trip start points for all dockless vehicles during the demonstration period. Each start point is color coded by the ward in which it ended.

The map shows that most trips started and ended in the same ward. The highest concentrations of trips occur in Wards 1, 2, and 6. This is supported by the finding that dockless bikeshare trips are typically short (under one mile). This information gives DDOT an idea of where dockless vehicles travel and can encourage providers to distribute their vehicles to facilitate access to the service.

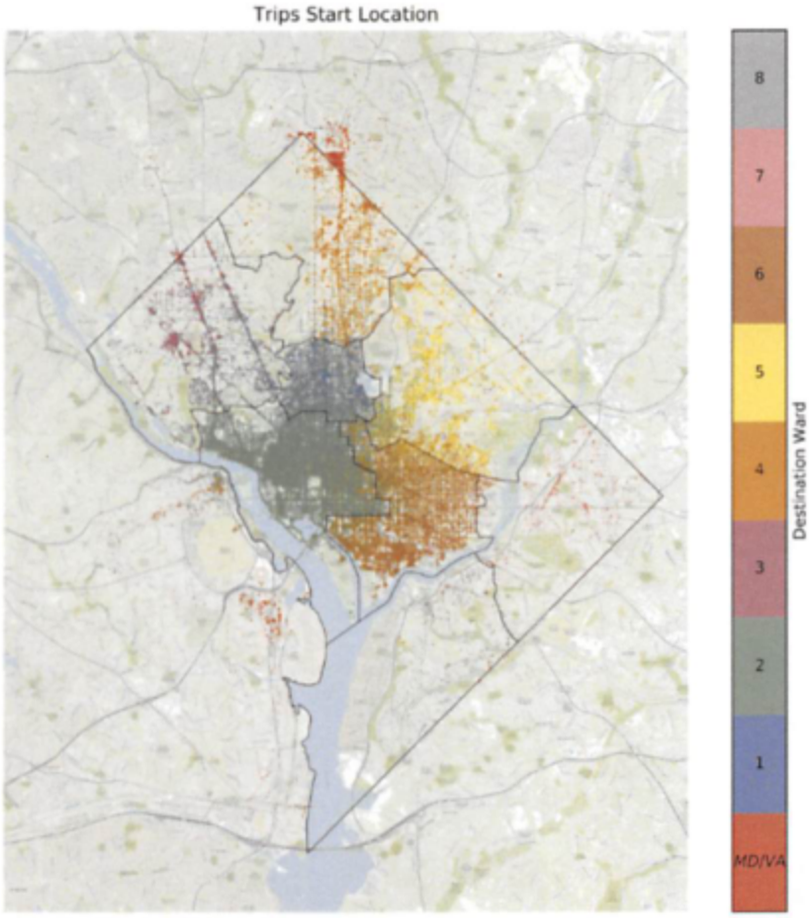
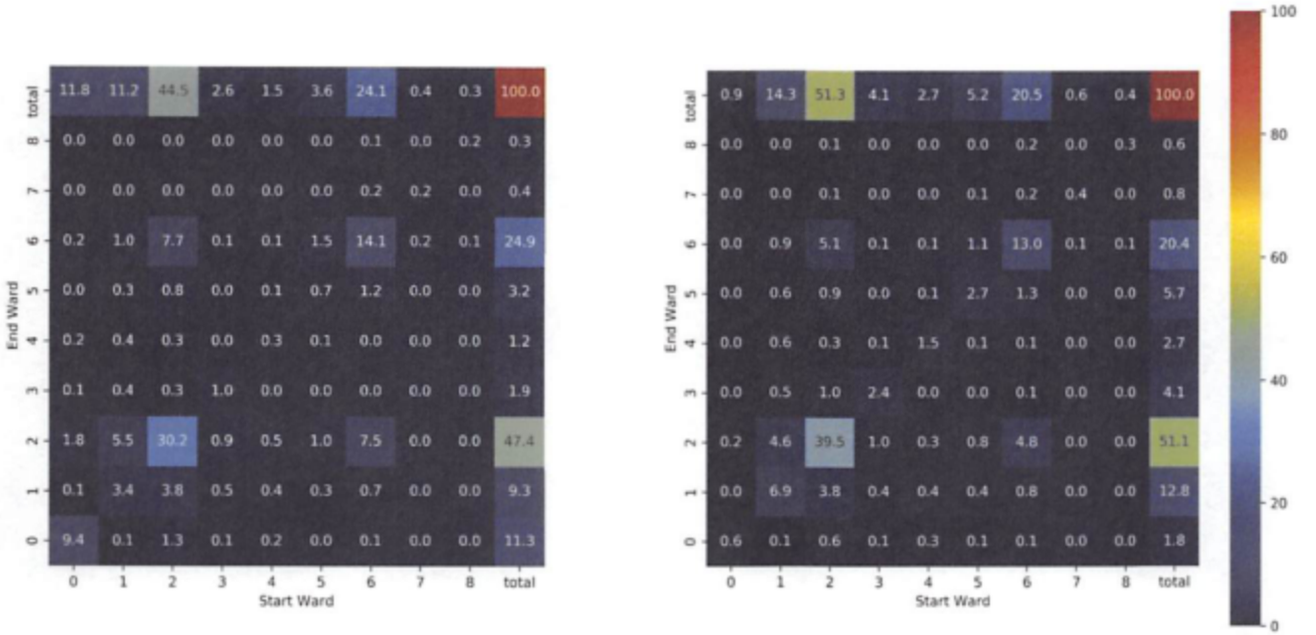


Figure 4 Dockless trip start locations, color coded by destination ward. Each point represents a trip that started at that location and is colored with the ward it ended in. Note that the vast majority of trips begin and end in the same ward.

For a better understanding of the trip distribution across the District, Figure 5-a and Figure 5-b shows the percentages of trips traveling between wards for Capital Bikeshare and dockless bikeshare respectively.

The majority of trips made on both dockless and station-based systems started and ended in Ward 2. There are similar patterns for Capital Bikeshare, however, the share of trips starting and ending outside the District of Columbia is around nine percent for Capital Bikeshare and less than one percent for dockless. This is expected because during the demonstration, only one surrounding jurisdiction (Montgomery County) also ran a dockless bikeshare program while Capital Bikeshare is a regional system and is in five surrounding jurisdictions.

Overall, most of Capital Bikeshare trips started and ended in Wards 1, 2, 6 and outside of the District of Columbia. Dockless operators have similar trip distribution excepting trips outside of the District.



a) Capital Bikeshare **b) Dockless Bikeshare**

Figure 5 Heat map matrix showing the percentage of Capital Bikeshare and dockless bikeshare trips across the wards of the District. ("Ward 0" represents locations outside the District.) More than 50 percent of dockless trips start or end in Ward 2.

The geographic analysis showed similar patterns for dockless and Capital Bikeshare. This seems to indicate that dockless operators have not significantly increased ridership among areas and residents that are underserved by Capital Bikeshare today. Trips taken on dockless (non-electric) bicycles have very similar origins and destinations as Capital Bikeshare trips. In the district, Capital Bikeshare has substantial coverage and many dockless trips start or end within walking distance from a Capital Bikeshare station. Still, given the use and ridership of dockless, it is possible that dockless bikeshare is supplementing the available fleet and providing flexibility to meet the demand of travelers.

One of the critical differences between Capital Bikeshare and dockless is the introduction of electric-powered vehicles. The introduction of scooters to the demonstration in March 2018 increased the size of the electric-powered dockless fleet and provided an opportunity to explore the differences between modes.

Modal differences

Referring back to Figure 3, ridership patterns differ across modes. Non-electric dockless vehicles have achieved fewer average rides per day per vehicle over the course of the demonstration, compared to both electric dockless vehicles and Capital Bikeshare.

The following graphs compare the usage of dockless bikes, dockless scooters, dockless e-bikes, Capital Bikeshare members, and Capital Bikeshare casual riders from March 2018 (when scooters were introduced) to the end of May 2018. Figure 6 and Figure 7 show the usage of different modes during the day for week days and weekends. The peak period varies substantially across the modes during the working days but it occurs at almost the same time on weekends for all modes. Capital Bikeshare members and dockless e-bikes are the most similar. They have clear peak hours at 8-9 a.m. and at 5-6 p.m. with a smaller peak around noon at 12-1 p.m. This suggests that they are often used for commuting.

Casual Capital Bikeshare riders, who do not have a membership, do not have a morning peak. Starting at 6 a.m., the number of casual rides gradually increases reaching the highest point at 5 p.m., and then it precipitously drops. Morning peak for dockless bicycles and dockless scooters last longer, from 8-10 a.m. Scooters have their highest usage between 12 p.m. to 6 p.m. Due to the standard practice of removing fleets in the evening, for charging purposes, the scooters have the lowest usage after 6 p.m. Dockless afternoon peak happens between 5 p.m. to 7 p.m.

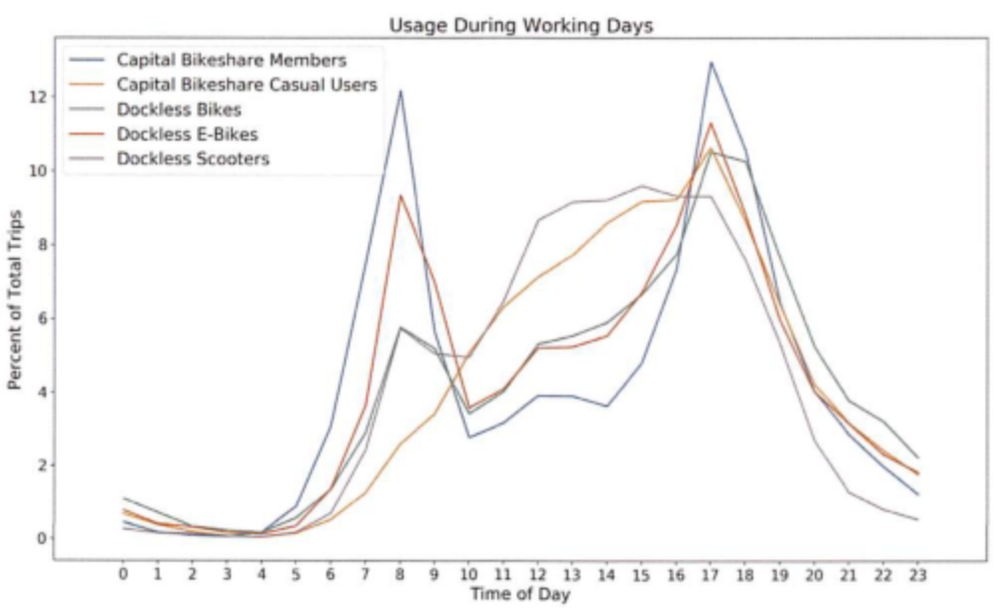


Figure 6 Usage trends over the course of the week day for different modes of vehicle sharing. Capital Bikeshare members usage peaks during commute times and dockless e-bikes usage follows the Capital Bikeshare membership trend.

Around 80 percent of rides during weekends happen between 10 a.m. and 6 p.m. and this is common in all the modes. Similar to the week day pattern, scooters trips are concentrated during daylight hours.

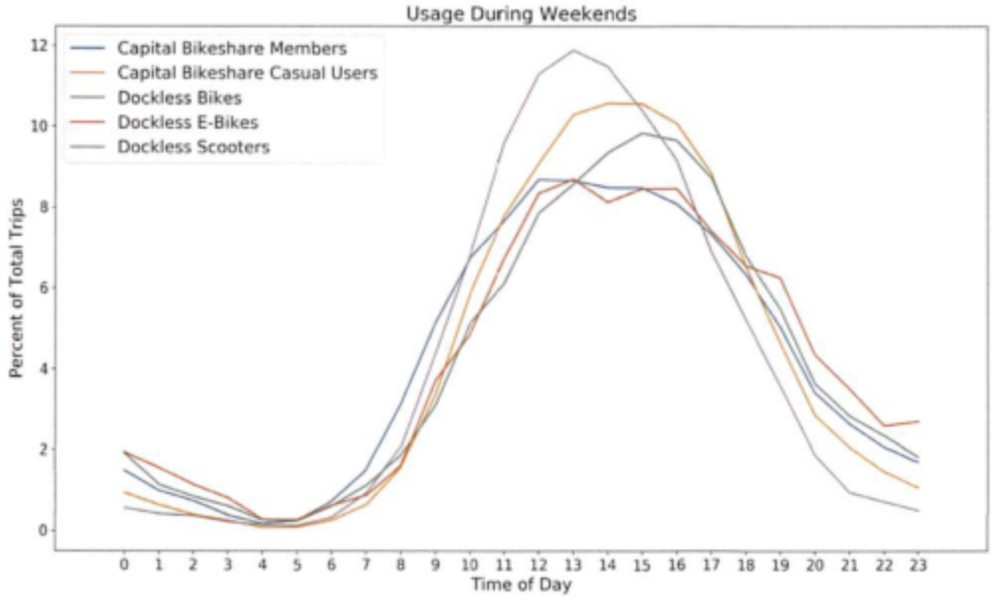


Figure 7 Weekend usage trends for different modes of vehicle sharing. Trends are similar across all modes.

As the previous graphs show, trip patterns differ throughout the week. Figure 8 shows the distribution of trips made by mode over the week. Most of the trips for Capital Bikeshare members take place on week days and most casual riders' trips are during the weekends. Dockless scooters and bicycles show relatively even distribution throughout the week, whereas dockless e-bikes show a trend similar to Capital Bikeshare members.

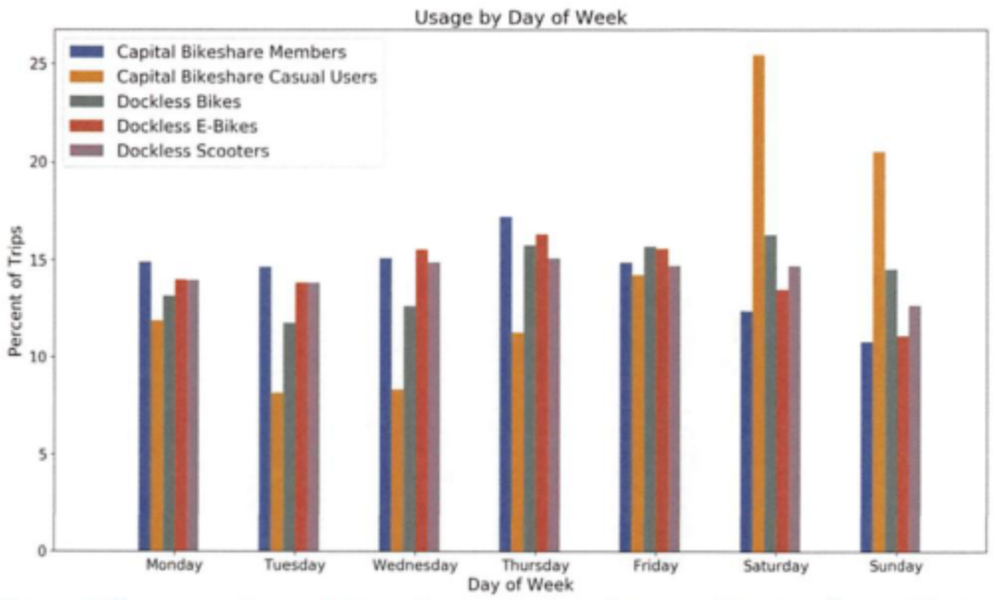


Figure 8 The percentage of trips taken each day of the week for dockless vehicles and Capital Bikeshare. Most modes have steady usage over the course of the week, except Capital Bikeshare casual usage peaks dramatically on the weekends.

The duration of trips also differs by mode. Capital Bikeshare members and scooters have the lowest median trip times at approximately 10 minutes. Capital Bikeshare casual riders have the highest median, around 25 minutes. Dockless e-bikes have a slightly higher median trip duration compared to other dockless vehicles (bicycles and scooters).

Overall Capital Bikeshare casual riders have the highest variation of trip duration and at the other end, Capital Bikeshare members had the lowest variation. Figure 9 graphically shows these findings in a box plot.

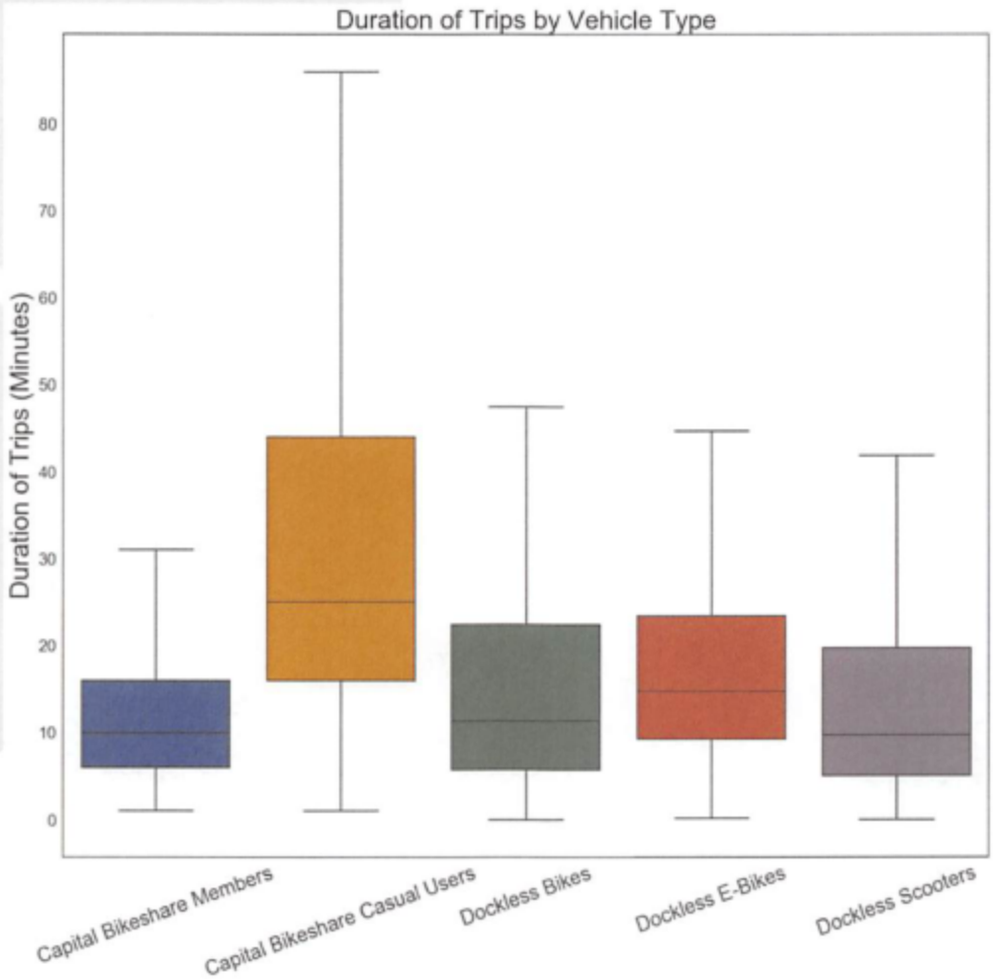


Figure 9 Duration of trips by mode. The colored area in each box plot shows the majority of trip durations for the vehicle or membership type. On average, across all modes, trips are under 20 minutes. However, Capital Bikeshare causal riders have a higher average trip duration and more variation in the duration than other modes.

In all, the modal analysis suggests that different modes serve different purposes. The survey responses showed the most common uses for dockless vehicles were running errands and social travel. The findings suggest that the modes can work together in a complementary system.

4.2 Ensuring a Safe Transportation System

DDOT tracks crashes and other safety incidents with dockless vehicles via MPD safety data. In addition, the pilot permit terms and conditions required information on all safety incidents and crashes to be reported by the companies directly to DDOT. Through July 2018, thirty crashes were reported to DDOT during the demonstration period (Figure 10). Additional crashes and injuries may have occurred that were not reported either to MPD or the companies.

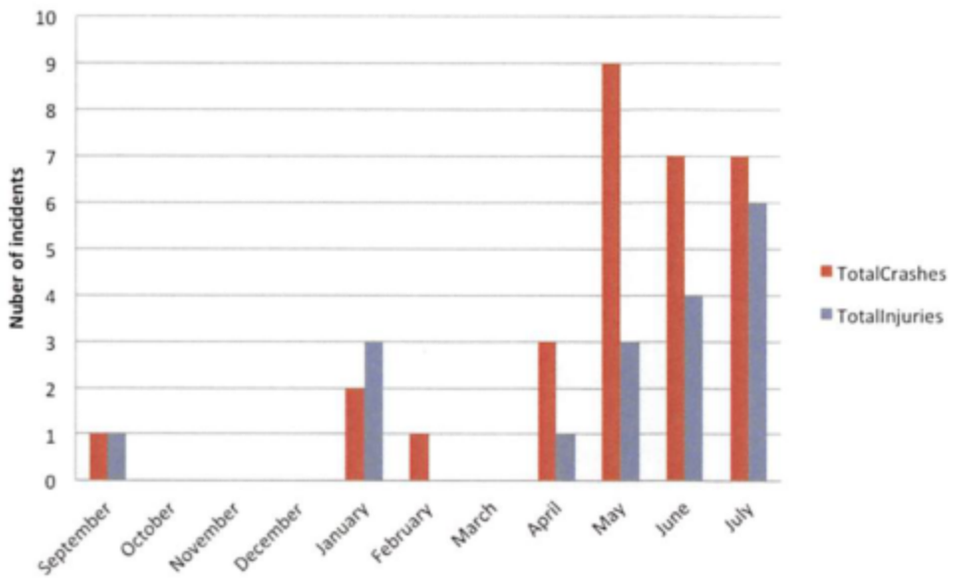


Figure 10 Crash and Injury Incidents reported by dockless companies

Dockless Vehicle Quality

Companies were required to provide the number of vehicles lost or stolen as well as how many vehicles in their fleet were decommissioned (for maintenance or vehicle upgrades). Figure 11 shows the number of vehicles reported to have been removed from the fleet over the pilot period.

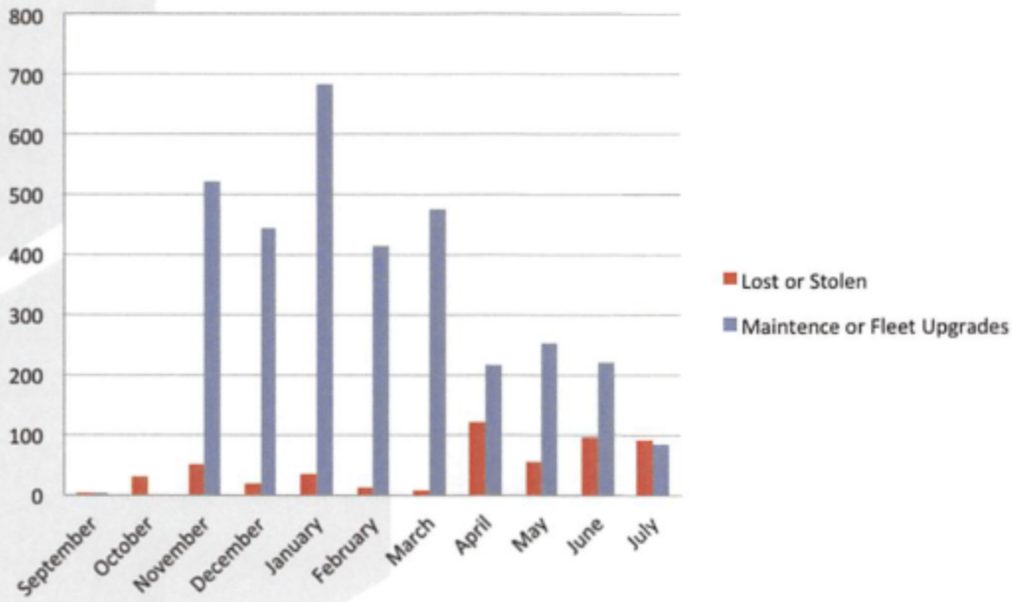


Figure 11 Vehicles removed from fleet as reported by dockless companies

In addition to the data reported from the companies DDOT conducted a field audit in late July to inspect the quality and safety of the vehicles. Of the 181 inspections, the majority (81 percent) of the vehicles inspected were not missing parts. Of those that were, the majority of the defects were rear light/reflector (8 percent), handlebar grips (6 percent), or rear fenders (5 percent). Failure to maintain the rear light/reflector is a critical maintenance concern as this is a key safety feature.

Other important findings include tire inflation, where only 68 percent of bikes had appropriately inflated tires. Under-inflated tires can make them more prone to puncturing, create a less stable platform for riding, and force users to exert more energy during trips. Only seven of the 181 audited vehicles were found to have deficient brakes. Dockless companies reported on the types of maintenance repairs they conducted each month over the course of the demonstration (Figure 12). This information complements the field audit and illustrates the types of repairs that are performed to maintain vehicle fleets.

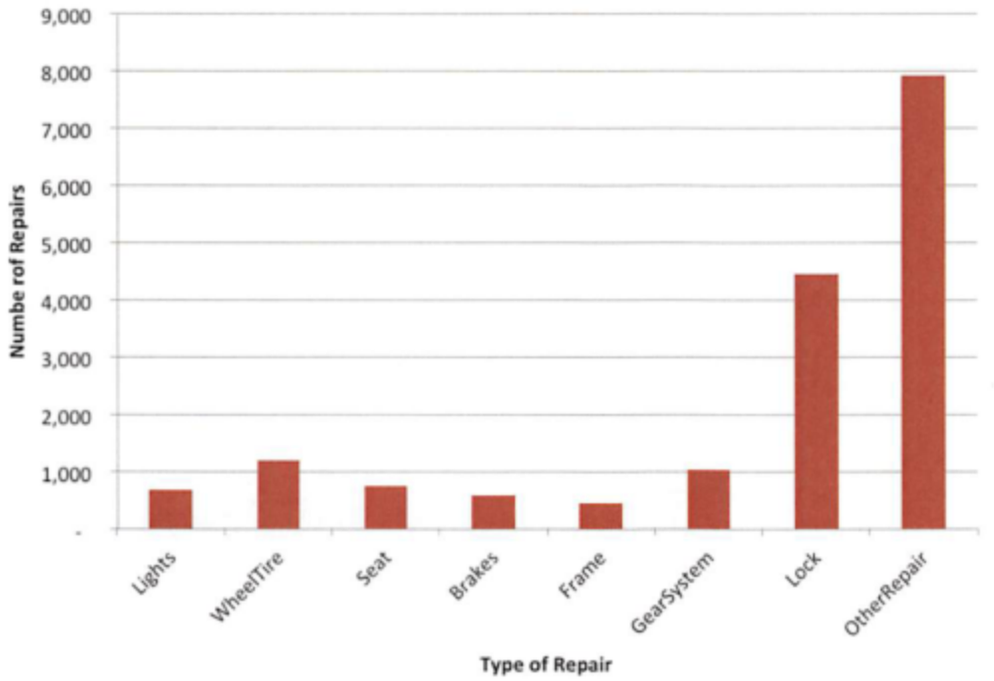


Figure 12 Number of repairs conducted by all companies over the demonstration period by type of repair.

Parking

A major concern with the dockless vehicle model is improper parking in the public right-of- way. Without docking stations, vehicles can be placed in pedestrian and frontage zones, inhibiting pedestrians and making travel difficult for people with disabilities or people pushing carriages. A large focus of the field audit revolved around parking behaviors of the dockless user base.

Out of the 181 completed inspections, six vehicles were not found. Of the remaining vehicles, 68 percent of vehicles were parked within the amenity zone or landscape buffer. These are the preferred parking zones, as they are curbside and do not obstruct traffic. Twenty-one percent of vehicles were parked in the frontage zone, most typically against the face of buildings. The remaining 10 percent of inspected vehicles were parked undesirably. Approximately three percent were found within the pedestrian zone, and the other seven percent were found in other undesirable locations including private property.

Vehicles were also parked upright in 84 percent of the inspections. Bikes and scooters can present accessibility barriers and tripping hazards if laid down on the sidewalk or landscaping zone. The high rate of upright parking suggests confidence in both user behavior as well as the stability of the kickstand platform. Only 14 percent of bikes were parked at bike racks.

Since only one of the dockless bike companies operating during the start of the demonstration period possessed "lock-to" technology on their vehicles, this suggests that additional bike racks will be necessary with a lock-to requirement. Sixty-one percent of survey respondents said more bike parking would encourage proper parking behavior and 56 percent said designated parking areas would also assist.

The sample size of the field audit is fairly small (181 vehicles). The field team utilized the third- party mobile "Transit" app when searching for parked dockless vehicles, and only 59 percent of the vehicles could be located through visual observations. This could be a failure of the application, or it could be a failure of the GPS system the dockless companies utilize to track their assets. Since dockless fleet sizes during the pilot are capped, it could have been more difficult to find vehicles than expected. Still, despite the small sample size, the findings suggest that majority of dockless user behavior has been positive and followed established rules.

Idle time analysis

In addition to parking behavior, the duration between trips that the vehicle is parked is also of interest. A goal of the demonstration was to understand how frequently the dockless vehicles were used or if they were staying idle in the public space. The idle time analysis showed that the vast majority of bikes were idle less than six hours. On average during the day (between 7 a.m. and 7 p.m.), dockless bikes were idle approximately 2 hours and scooters less than one hour. Figure 13 shows the average idle time of bikes (Including e-bikes) and scooters, respectively. In addition to having a lower average, scooters also have less variation in idle time as shown by the shaded area around the line.

There is a steep increase in the idle time of dockless bikes after 7 p.m. This is because ridership decreases at night and bikes are typically left outside overnight. Dockless scooters, however, are typically out of the system for charging after 8 p.m., so they do not show high idle times at night.

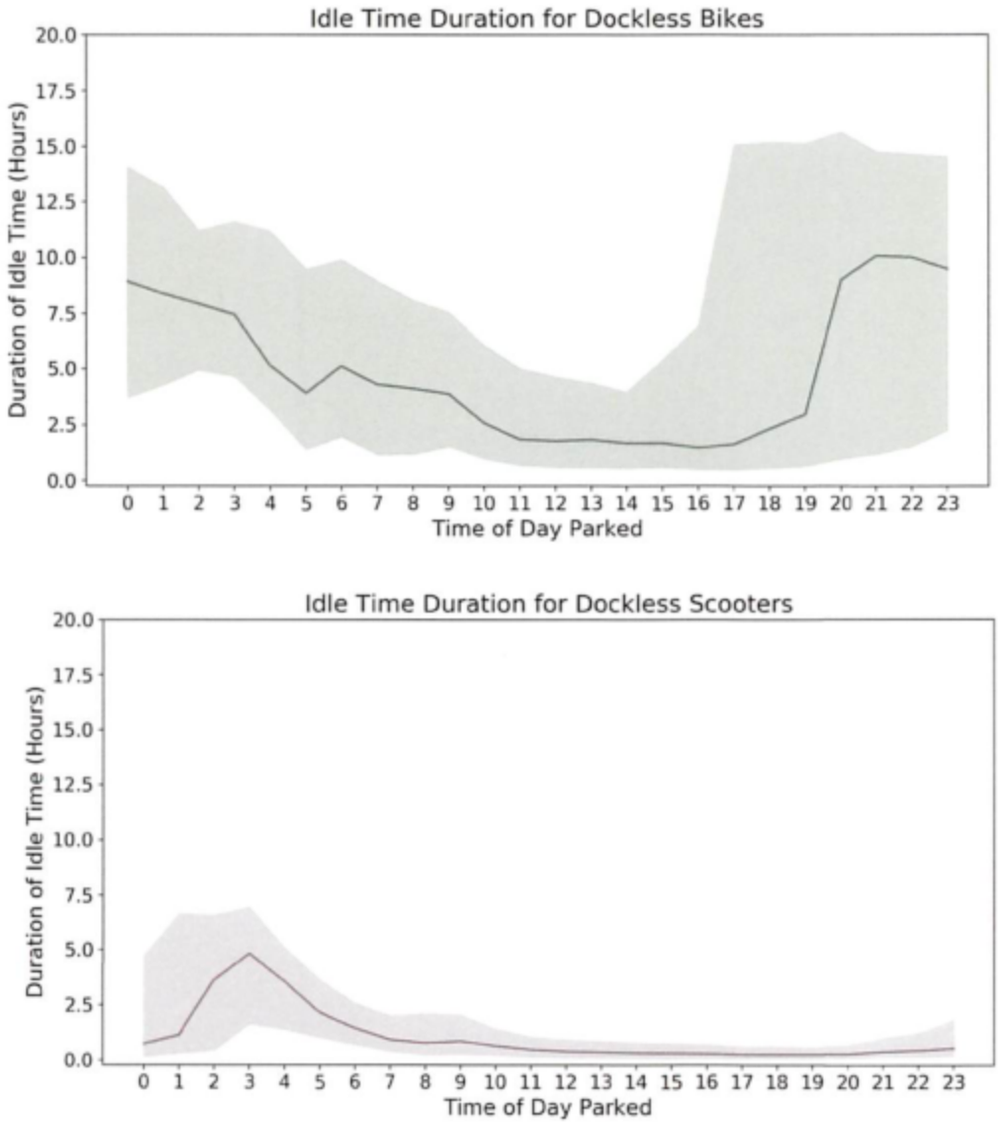


Figure 13 Idle time Duration for Dockless Bikes and Scooters. The solid lines on each graph show the average idle time. The shaded bands reflect the variation in idle time across the fleet. Idle times are higher for dockless bikes than scooters and highest over night for both modes.

Idle time differs across the District. Figure 14 and Figure 15 show the percent of trips that ended in each Advisory Neighborhood Commission single member district (SMD) and where the vehicle subsequently had an idle time of more than six hours. The gray SMDs did not have any idle duration data because vehicles that ended their trips in these SMD began their trips at a different location and therefore, they were not counted.

They might have moved because of rebalancing, recharging, or removal. Comparing the two modes shows that idle times of more than six hours is more prevalent for dockless bikes than dockless scooters. The fact that scooters go offline at night to charge plays a role in this difference. SMDs farther from the city center have higher percentages of trips with idle times over six hours. SMDs with the highest percentage of trips with idle time over six hours are in Wards 7 and 8.

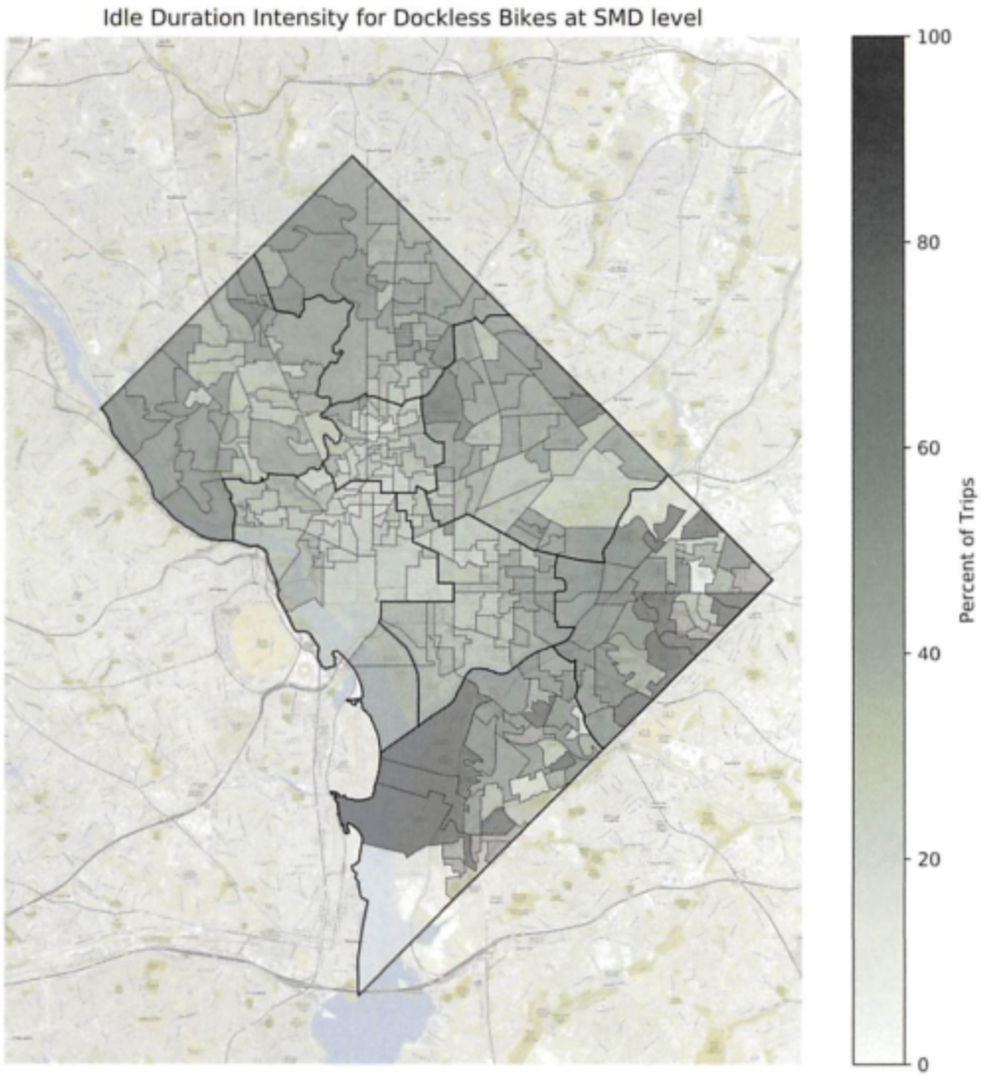


Figure 14 Percentage of dockless bicycle trips in each ANC Single Member District with idle time more than six hours. SMDs colored in gray had zero trips

Idle time gives DDOT an idea of the operations of the system but idle time over six hours is not necessarily negative. Personal bikes may stay in a legally parked location for up to five days and motor vehicles do not have a time limit (barring parking restrictions). On average, only 4 percent of dockless bikes are idle for more than two days.

4.3 Public feedback

While much of the public reaction to the demonstration period has been positive, legitimate concerns have been raised, primarily regarding improper parking of bicycles that is obstructing pedestrian access, causing hazards for persons with disabilities, or infringing on private property.

An analysis of the initial email comments DDOT received

Figure 15 Percentage of dockless scooter trips in each ANC Single Member District with idle time more than six hours. SMDs colored in gray had zero trips ending in that SMD.

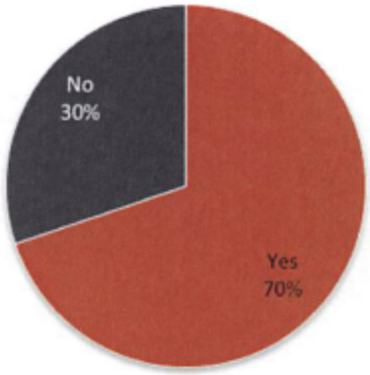
throughout the first half of the pilot showed that of 415 comments, the majority supported the program, but the primary negative concern was clutter, blocked pedestrian travel ways, and parking. A textual analysis for parking concerns (Figure 16) showed the most persistent terms in the comments were pedestrians, parking, nuisance, blocking, litter, and sidewalk.

Figure 16 Word cloud from textual analysis of public comments related to parking sent to dockless. bikeshare@dc.gov through April 1, 2018

Of the nearly 4,500 respondents to the survey, most had used the service and agreed that it should continue (Figure 17). Over 80 percent of the 800 respondents who did not believe that the program should be continued had not yet tried the service.Half of the respondents that used dockless vehicles used them at least once a week and 21 percent used them daily.

Respondents most frequently cited using dockless bikeshare because the systems are convenient, fun, and a fast and easy way to get around. All respondents provided up to four ways the program could be improved. The top ranked improvement at 64 percent was to increase the availability of vehicles ("there are too few bikes near me when I need one"). The second ranked improvement at 36 percent was increasing trails and protected bike lanes. Rounding out the top five with around 25 percent each were: bike parking behavior, maintenance of vehicles, and mid-trip locking capability.

Have you used dockless bikeshare?



I think the District should continue the dockless bikeshare program.

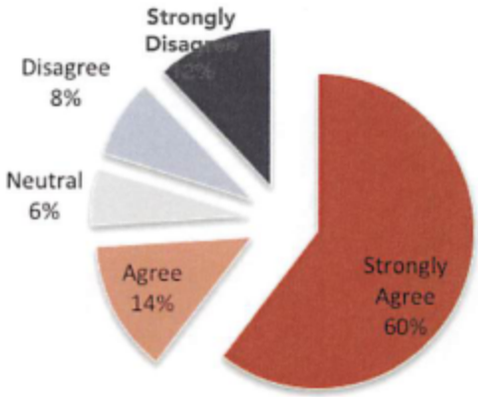


Figure 17: Percentage of respondents that have used dockless vehicle sharing in the District and sentiment towards the program

DDOT has been addressing parking concerns by implementing "Rack Attack," a concerted effort to rapidly increase the number of publicly accessible bike parking spaces citywide, through a combination of District-resources and a collaboration with Business Improvement Districts. DDOT will install 350 racks, which is over 700 bike parking spaces, by the end of 2018. BIDs have installed over 60 racks in 2018 and plan to install more.

5.0 Recommendations and Next Steps

The demonstration period has been helpful in understanding the impacts of dockless vehicle sharing in the District, but there remain unanswered questions. As DDOT continues to evaluate the program, there are key recommendations and next steps in program evaluation.

Addressing Active Transportation Goals

The program has shown promise, but there is not yet strong empirical evidence that dockless vehicle sharing is reaching different populations and locations than Capital Bikeshare. DDOT should better understand this issue and identify program requirements or incentives in this regard.

The dockless program appears to be additive to Capital Bikeshare. DDOT should continue to expand the dockless vehicle program while instituting programmatic changes to incentivize better parking behavior by users and better management practices by operators.

Ensuring a Safe Transportation System

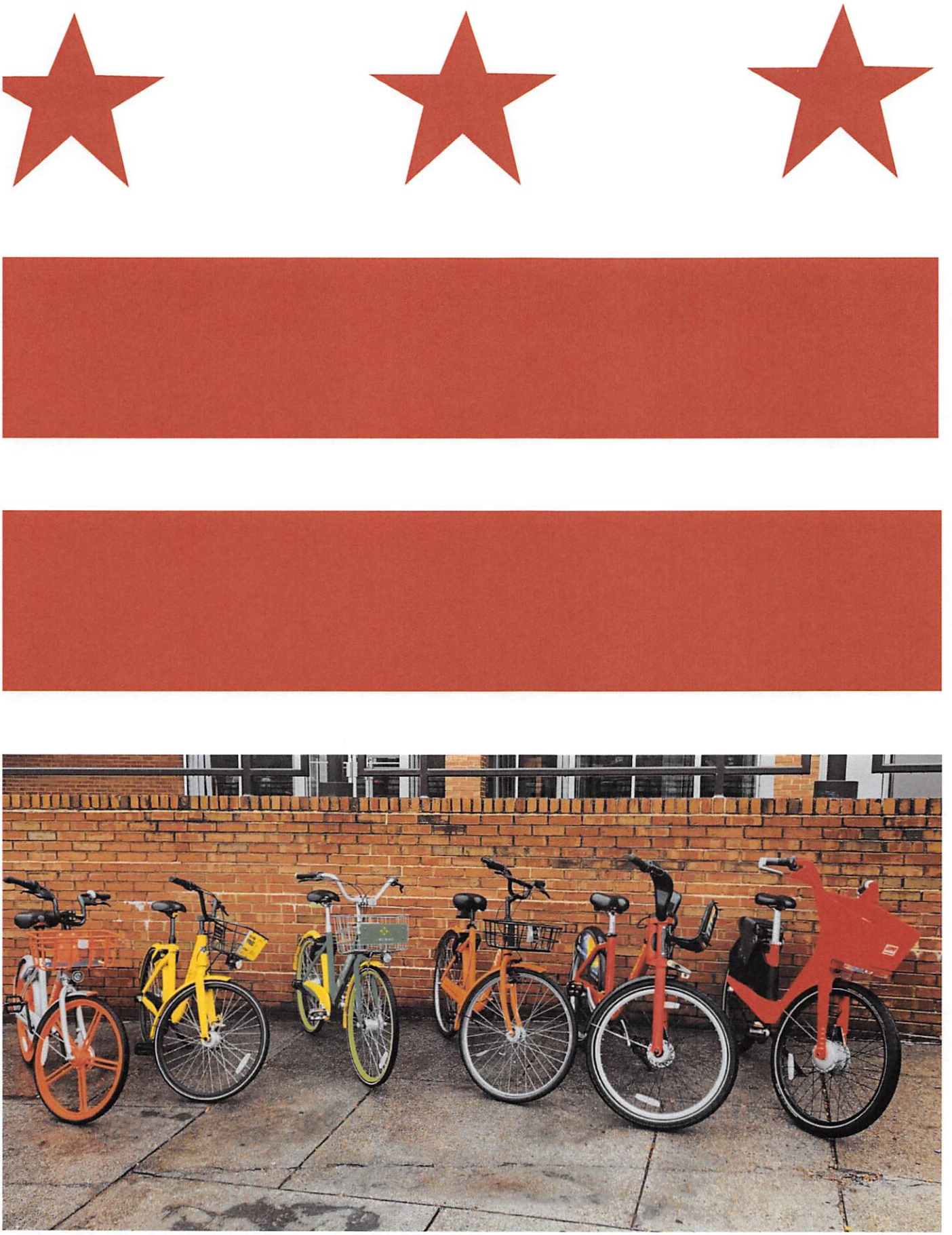
While visual inspections did not show widespread parking violations, those that do occur create mobility impediments. DDOT should develop an oversight and enforcement approach that minimizes negative issues.

Public Input

The dockless program is still rapidly evolving. DDOT should continue coordinating regular public surveys and other engagement tools that will inform the continued evolution of the program. As the District issues regulations for the program, the public will have additional formal opportunities to provide input.

Managing Bikesharing for the District

The program continues to show promise and the operator landscape continues to evolve rapidly. DDOT should identify the staffing resources necessary to institutionalize the dockless vehicle program successfully and work to build this capacity in order to successfully provide oversight, enforcement, and data transparency for the public benefit.



GOVERNMENT OF THE
DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR