Vehicle Safety Technology

Second Report

September 2016

Background and Introduction

In February 2014, Mayor Bill de Blasio released the Vision Zero Action Plan, the goal of which is to end traffic-related deaths in New York City. As the regulator of nearly 100,000 licensed vehicles that travel on New York City streets, the Taxi and Limousine Commission ("TLC") has a central role in achieving this goal.

As a part of Vision Zero, TLC is undertaking a range of safety-related initiatives, including the Vehicle Safety Technology ("VST") Pilot. During the VST Pilot, TLC is studying the use of innovative technologies that may improve the driving habits of TLC licensees and cause a reduction in crashes in TLC-licensed vehicles. Examples of these technologies include electronic data recorders (or "black boxes"), cameras, driver alerting/collision avoidance systems, and analytics platforms. TLC intends to use the findings of the Pilot to inform any regulation of these innovative technologies.

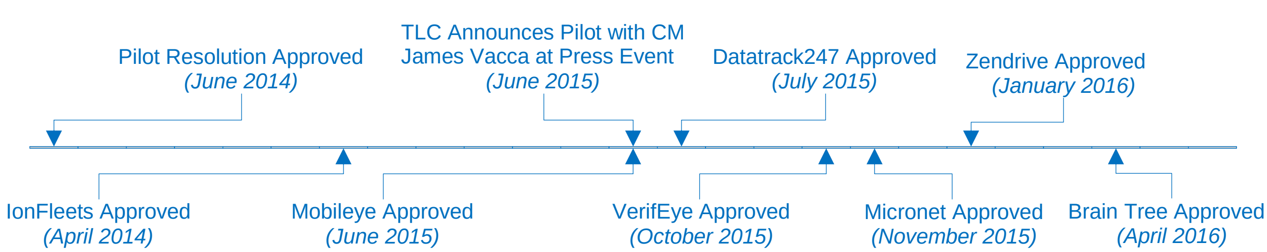
Developments since the Last Report

The initial VST Pilot Resolution was adopted by the Commission in June 2014, and the yearlong program commenced in April 2015 when the first Participant was approved. In February 2016, the Commission voted to extend the Pilot for another year, which will end in April 2017.

Since the previous report was issued in November 2015, TLC has approved four more Participants and continues to work with other parties interested in joining the Pilot. At the time of the writing of this report, nearly 350 vehicles are participating in the Vehicle Safety Technology Pilot with seven Participants.

Extending the Pilot for an additional year allows Participants more time to capture data from the growing number of participating vehicles and gives TLC an ability to better evaluate the impact of these technologies on driver safety and, in particular, on crashes. The addition of more vehicles will likely decrease volatility in aggregate alert rates, and help overcome the challenge of having multiple drivers operating individual vehicles. Crashes per vehicle have declined slightly for all vehicles participating in the Pilot, a promising trend that TLC will continue to monitor as the Pilot continues.

Pilot Timeline



Description of Pilot Participants

Table 1: Summary of Participants and TLC Partners

Participant	Technology	Date Approved	Total Vehicles	Yellow Taxis	Green Taxis	FHVs
IonFleets	Black Box, Alerts, Camera	Apr 2014	**74**	16	3	55
Mobileye	Black Box, Alerts	Jun 2015	**20**	15	0	5
DataTrack247	Black Box, Alerts	Jul 2015	**227**	0	0	227
VerifEye	Black Box, Alerts, Camera	Oct 2015	**6**	2	0	4
Micronet	In-Vehicle Tablet, Black Box, Camera	Nov 2015	**3**	0	0	3
Zendrive	Smartphone Telematics	Jan 2016	**13**	0	0	13
Brain Tree	Black Box, Alerts	Apr 2016	**3**	1	1	1
		Total	**346**	**34**	**4**	**308**

In this report, "Participants" refers to companies who provide Vehicle Safety Technologies under the Pilot. The TLC licensees with whom the Participants are working during the Pilot are referred to as "TLC Partners." Table 1, above, summarizes the kinds of technologies each Participant is providing under the Pilot, and how many TLC Partners are using each of the technologies. The types of vehicles TLC Partners drive in the Pilot are broken out into three categories: yellow taxis, or medallion taxis; green taxis, which are also known as Street Hail Liveries or Boro Taxis; and for-hire vehicles ("FHVs"), which is a catchall term encompassing the Livery, Black Car and Luxury Limousine industries.

Mobileye *(approved June 2015)*

Mobileye is a publicly-traded company that sells driver alert systems directly to vehicle manufacturers or as an aftermarket solution for fleets or vehicle owners. In the Pilot, Mobileye is providing its aftermarket solution to a fleet of primarily yellow taxis. Their technology consists of a forward-facing sensor mounted to the windshield, a small LED screen that sits on top of the dashboard, and a motor mounted underneath the driver's seat. The sensor is used to continuously monitor and analyze road conditions, identifying situations that may be dangerous to the driver. If, for instance, the system senses that the driver is departing from a lane without signaling, or following a vehicle too closely, it will provide an auditory and visual alert through the device mounted on the dash, and it will vibrate the driver's seat. For the Pilot, Mobileye has added a black box to its system. The black box is used to help prove the concept of the Mobileye technology, which would not otherwise generate data or reports for TLC's analysis. In addition to the raw data reported by the black boxes, TLC staff also receives reports from Mobileye, which show the company's analysis of behavior over time for drivers who are using the technology.

Participant	Technology	Total Vehicles	Yellow	Green	FHV
Mobileye	Black Box, Alerts	20	15	0	5

Figure 1: Mobileye Technology System

IonFleets *(approved Apr 2014)*

IonFleets bundles and provides services offered by several other companies for its customers to use in a single package. For the VST Pilot, IonFleets has provided its TLC Partners with a technology system that includes three cameras (one driver-facing, one forward-facing and one rear-facing), Mobileye's alerting system (as described above), and a black box. The three different streams of information created by these technologies are tied together in a software platform, which allows fleet managers to review footage of drivers operating the vehicle, or to see reports on the drivers' driving habits.

Update: IonFleets' driver-facing camera has been approved to be used as an In-Vehicle Camera System (IVCS) while the company is participating in the Pilot. An IVCS is required to be installed in any Livery vehicle or yellow taxi that does not have a partition. The purpose of the system is to protect the driver against robbery or assault. At the end of the Pilot, TLC will evaluate IonFleets' camera to determine whether it can continue to be used as an IVCS.

Participant	Technology	Total Vehicles	Yellow	Green	FHV
IonFleets	Black Box, Alerts, Camera	74	16	3	55

Figure 2: IonFleets Technology System

Datatrack247 *(approved July 2015)*

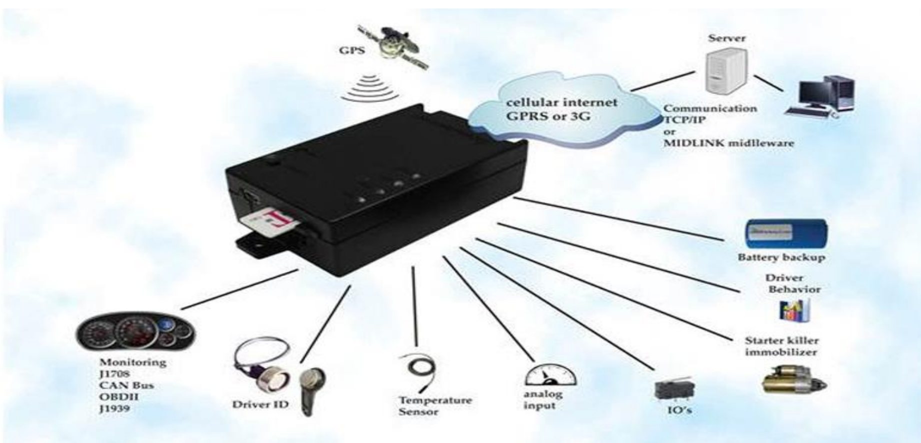
Datatrack247, another service bundler, offers an array of solutions that are tailored to meet its customers' needs. For the VST Pilot, the company is providing its TLC Partners with a black box that tracks g-force events—such as hard braking, hard accelerating, hard turning and abrupt lane changes—in vehicles. The system has the ability to trigger a vehicle's seat belt alarm when erratic driving is sensed as a form of driver alert.

Historic and real-time information about participating vehicles is stored in a software platform accessible to its customers. The software can also be used to dispatch trips, and is used in some cases to generate trip records that are submitted to TLC as part of a reporting requirement for all TLC-licensed bases.

Update: In the two months leading up to this report, Datatrack247 has ramped up its involvement in the VST Pilot, and is now sending TLC telematics data from nearly 230 TLC-licensed vehicles.

Participant	Technology	Total Vehicles	Yellow	Green	FHV
DataTrack247	Black Box, Alerts	227	0	0	227

Figure 3: Datatrack247 Technology System



New Pilot Participants

VerifEye *(approved October 2015)*

VerifEye is also a fully authorized IVCS provider. For the VST Pilot, the company has installed its VOC-1 camera in a mixture of for-hire vehicles and yellow taxis. Their device (pictured below) houses forward- and interior-facing cameras, as well as g-force sensors that monitor driver behavior. When the system identifies a g-force event, it will provide the driver with an audible alert and will upload a video clip to the cloud. The company's online portal provides fleet managers or vehicle owners with access to these video clips, along with telematics information collected from the black box. VerifEye also provides a driver score for each driver who has used the system, which is based on data collected from the VOC-1.

Participant	Technology	Total Vehicles	Yellow	Green	FHV
VerifEye	Black Box, Alerts, Camera	6	2	0	4

Figure 4: VerifEye Technology System

Micronet *(approved November 2015)*

Micronet is providing a safety system that maximizes a driver's view of activity surrounding the vehicle. Four external cameras—one forward-, one rear- and two side-facing—are connected to a screen and data terminal inside the vehicle (pictured below in Figure 5), which displays views of the driver's blind spots. The data terminal also streams telematics data to the cloud. Through continuous monitoring and analysis of the data, Micronet assigns drivers a score, taking into account aggressive and distracted driving tendencies detected by the system. Micronet has also developed a portal for fleet managers to access driver performance reporting, giving them a tool to identify and coach their riskier drivers.

Participant	Technology	Total Vehicles	Yellow	Green	FHV
Micronet	In-vehicle tablet, Black Box, Camera	3	0	0	3

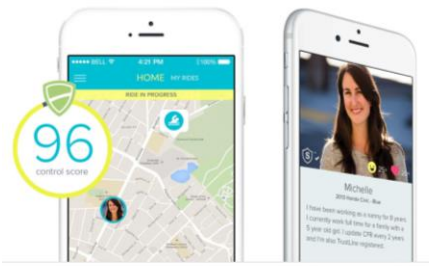
Figure 5: Micronet Technology System

Zendrive *(approved January 2015)*

Zendrive is providing a group of for-hire vehicle drivers with a smartphone application that measures driving performance. The app uses the phone's GPS, accelerometer, and gyroscope to measure behaviors that are typically collected by telematics devices, such as hard braking, hard acceleration, hard turning, and speeding. This system is also capable of monitoring a driver's interaction with the smartphone while operating the vehicle, which the company uses to measure distracted driving. The app can be used alone on a smartphone, or it can be used with other apps, such as a dispatching app. Zendrive also provides driver safety scoring through its portal based on the data it collects.

Participant	Technology	Total Vehicles	Yellow	Green	FHV
Zendrive	Smartphone Telematics	13	0	0	13

Figure 6: Zendrive Technology System



Brain Tree *(approved April 2016)*

Brain Tree is a service bundler providing a black box solution to TLC Partners. In addition to providing typical telematics information about driver behavior, the company's system also taps into a vehicle's on-board computer to provide a fleet manager or owner with diagnostic information about a vehicle over the air. The black box also provides driver alerts in real time when an erratic driving event is detected. If a driver accumulates several alerts in a short span of time, an indicator in the cabin of the vehicle will change progressively from green to red to alert the driver that his or her driving quality has continued to slide.

Participant	Technology	Total Vehicles	Yellow Taxis	Green Taxis	FHVs
Brain Tree	Black Box, Alerts	3	1	1	1

Figure 7: Brain Tree Technology System

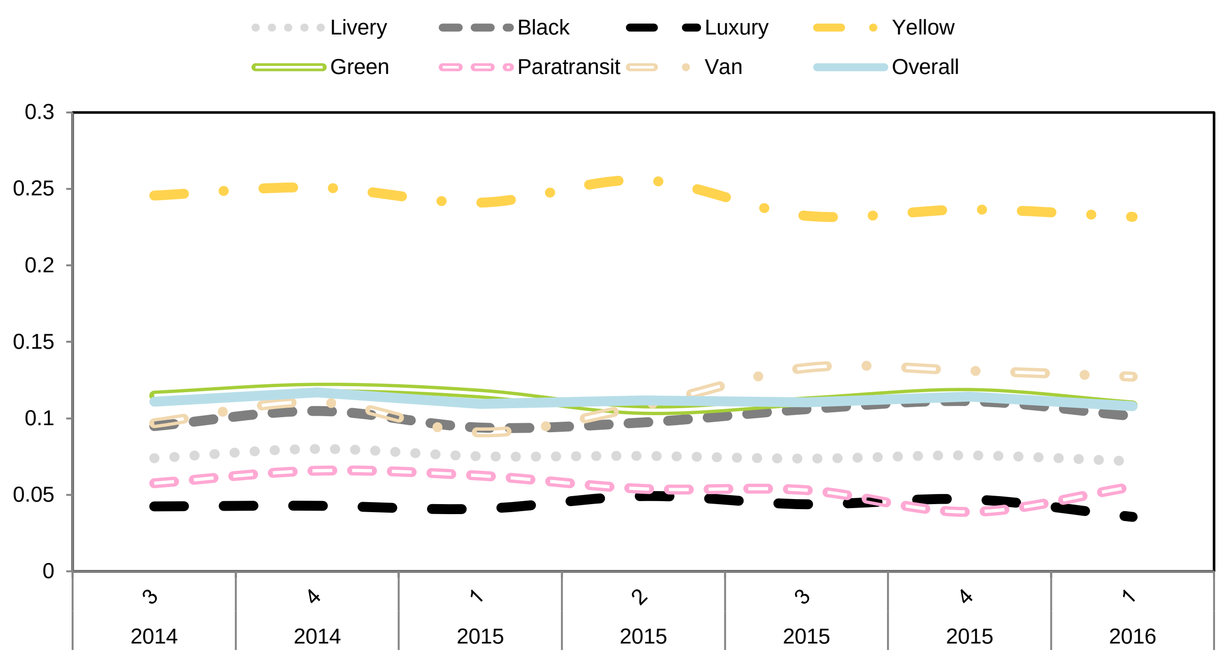
Vehicle Safety Technology's Effect on Collision Rates

Industry-wide Trends

Figure 8 below shows the per-vehicle crash rates for TLC-licensed vehicles from the second half of 2014 through the first three months of 2016. On a per-vehicle basis, the overall crash rate in the second half of 2015 was down 1.41% compared to the second half of 2014. Similarly, the crash rate in the first quarter of 2016 was down 1.38% compared to the first quarter of 2015. The drop in the overall crash rate provides context for crash reductions observed in the vehicles participating in the VST Pilot. For instance, this decrease may isolate the effect that other Vision Zero initiatives—for example, lowering the citywide speed limit to 25 miles per hour at the end of 2014—have had on TLC-regulated industries.

The industry-specific crash rates in Figure 8 are based on total crashes by industry segment, normalized by the average number of vehicles licensed in each industry over the analysis period. The chart is not adjusted for mileage or time so sectors where cars are on the road longer and travel more miles will have a higher crash rate overall, even though their per-mile crash rates may be similar.[1]

Figure 8: Average Crashes per Quarter per TLC-licensed Vehicle *(not adjusted for mileage or time)*



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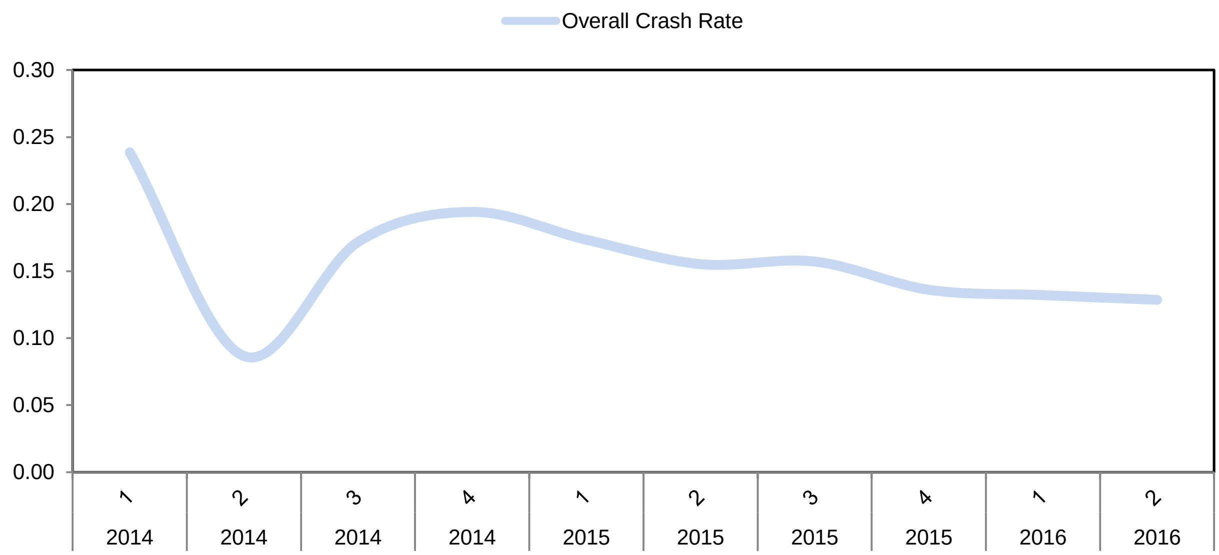
[1] The crashes counted here are any crash where the TLC-licensed vehicle was included in a police report of a crash, which can include minor property damage crashes and can include crashes where the TLC-licensed driver was only tangentially involved.

Crashes in the Pilot

The graph below shows the historical crash rate for vehicles participating in the Pilot, and that were identified by license plate by Participants. Because of relatively small sample sizes, or numbers of TLC Partners, the crash rate per Participant is volatile quarter over quarter. When all participating vehicles are taken as a whole (represented below in Figure 9), significant downward trend in the crash rate is clear.

Compared to the industry-wide decrease of 1.38% from the first quarter of 2015 to the first quarter of 2016, crash rates for vehicles participating in the Pilot decreased 23.84% between the same periods. However, the volatility of individual Participant crash rates quarter over quarter, sometimes well above the overall crash rate, coupled with the fact that the downward trend in crash rates begins at least three quarters before the Pilot began, limits our ability to tie the use of VST systems with any reduction in crash rates at this time. Monitoring vehicle crash rates over a longer time should give TLC a clearer sense of the effectiveness of these devices in preventing crashes.

Figure 9: Crashes per Quarter per Participating Vehicle



Vehicle Safety Technology's Effect on Driver Behavior

As mentioned in the first VST Report, Participants' alerts fall into two categories: reactive and proactive. Of the four Participants who have been added since the previous report, two provide drivers with reactive alerts after an erratic driving event has been detected. These alerts remind the driver that a specific behavior is unsafe with the aim of preventing that behavior in the future. One of the companies, Zendrive, provides the driver with feedback after each trip. Three of the four new participants will also provide drivers, fleet managers, and/or owners with driver scores, which are algorithmic scoring of drivers' behaviors based on the types of data that a system collects.

Table 2: Main Sources of Alerts

	Mobileye Sensors	**Black Boxes/Smartphones**
Sensor	Forward-facing camera	Accelerometer, GPS
Object Detection Capabilities	Can detect other vehicles, pedestrians, and painted lines in line-of-sight	N/A
Triggering an Alert	Actively performs calculations based on trajectory of sensed objects and vehicle to anticipate potential collisions	Monitors g-forces imposed on vehicle, registering when they exceed a preprogrammed threshold. Measures distance using GPS and time to calculate speeding events.
Used by	IonFleets, Mobileye	All Participants

Below, we have provided a summary of our analysis of each Participant's alert data. We have also included geographic analysis of alerts by Mobileye, VerifEye, and Datatrack247, the three Participants that provided us with the most geographic data.

Overall, the results are mixed. For TLC Partners using some VST solutions, alerts have declined over time. For others, TLC has observed an increase over the course of the Pilot. Ultimately, the goal of incorporating these systems into TLC-licensed vehicles is to discourage drivers from performing the detected behaviors (speeding, hard braking, hard acceleration, etc.). When drivers are not consistently exposed to these systems day in and day out, or when coaching or remediation does not accompany the alerts, the behavior may continue. However, drivers who operate vehicles with these systems even sporadically have an opportunity in the moment to correct the behavior, so an increase in alerts can result in positive short-term corrections for drivers. With more TLC-licensed vehicles incorporating these systems, drivers will be more consistently exposed to alerts, scoring, or training, creating the potential for more long-term behavior changes.

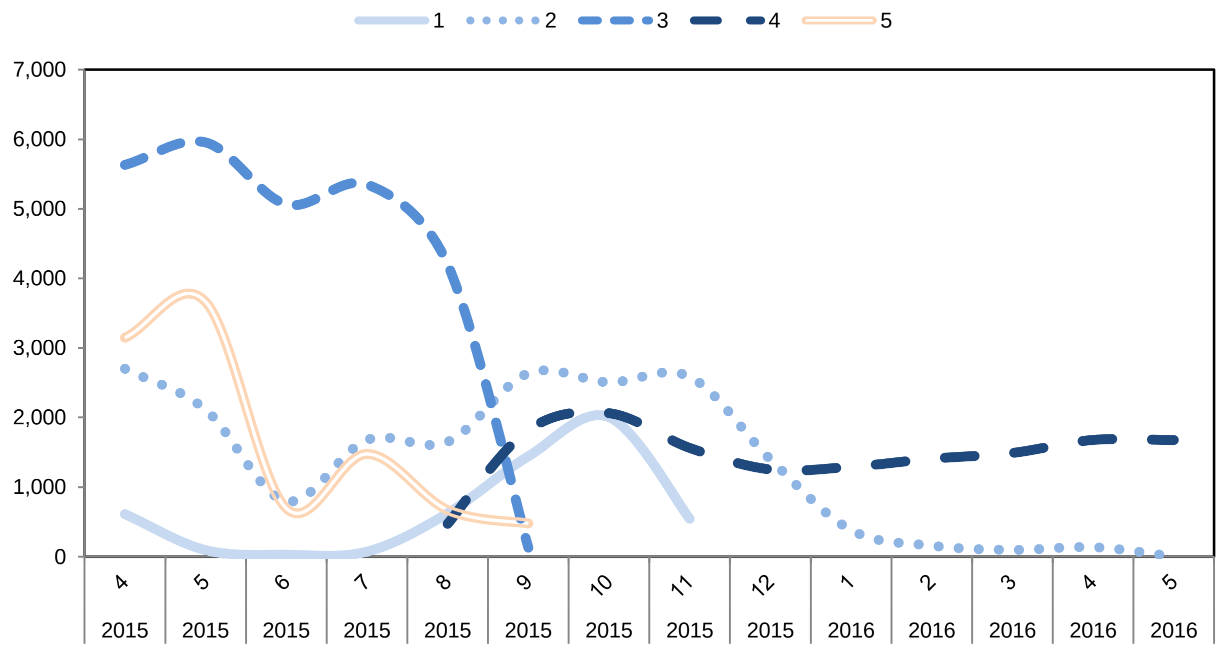
In the next report, TLC intends to explore the sensitivities, or calibration, of the devices being used by each Participant. For example, some of the companies in the Pilot have calibrated their devices to mark an "event" using low g-force levels, and some have chosen to wait until higher levels have been achieved. As can be seen in the sections below, the absolute number of events recorded by each Participant can vary and can make comparisons between companies difficult. Looking at the thresholds that each company uses to create events will help TLC make those comparisons between drivers for different Participants.

IonFleets

IonFleets has two waves of TLC Partners in the pilot. The first began at the start of the Pilot, but has had issues with consistency of time spent driving. The second group started recently, but consists of a larger number of vehicles. Figure 10 below shows alerts over time for the first group of vehicles and Figure 11 shows alerts for the second. The alerts have not been normalized in these graphs—IonFleets does not provide TLC with mileage data with which to normalize them.

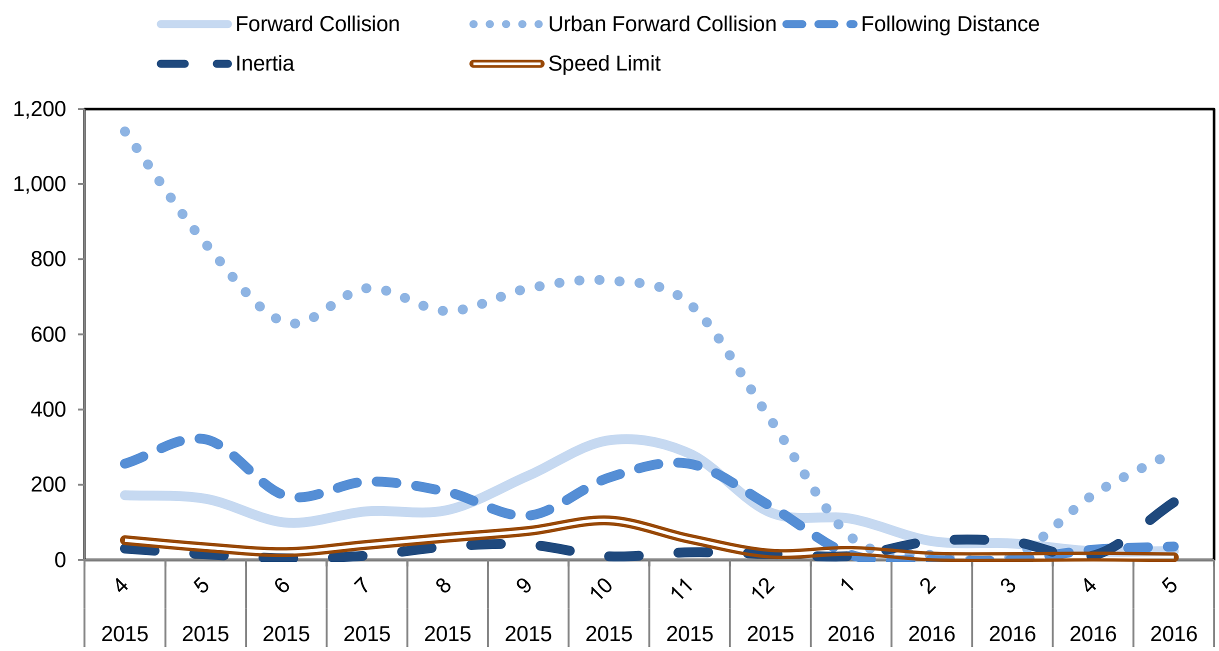
While alert rates tended to drop over time in Figure 10, TLC does not yet know whether this is as a result of the fleet driving fewer miles per vehicle over time, or whether drivers have changed their behavior over time. As seen below, some vehicles did not report data for stretches of several months.

Figure 10: IonFleets Alerts for Five Longest-running Vehicles

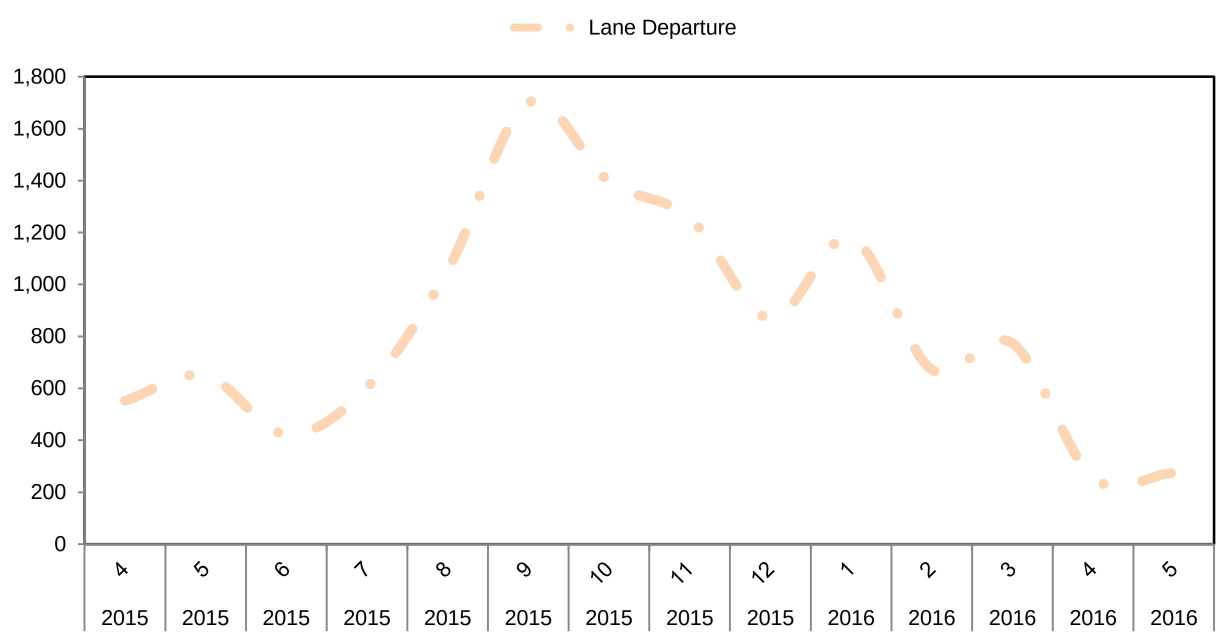


IonFleets generates warnings based on g-force data from its black box system and from Mobileye sensors. The number of alerts that come from the Mobileye system far exceeds the number that are generated by the black box. On a per-vehicle basis, alerts trend downward over time (but again, this would not take a possible reduction in miles driven per vehicle into account).

Figure 11: IonFleets Alerts per Participating Vehicle



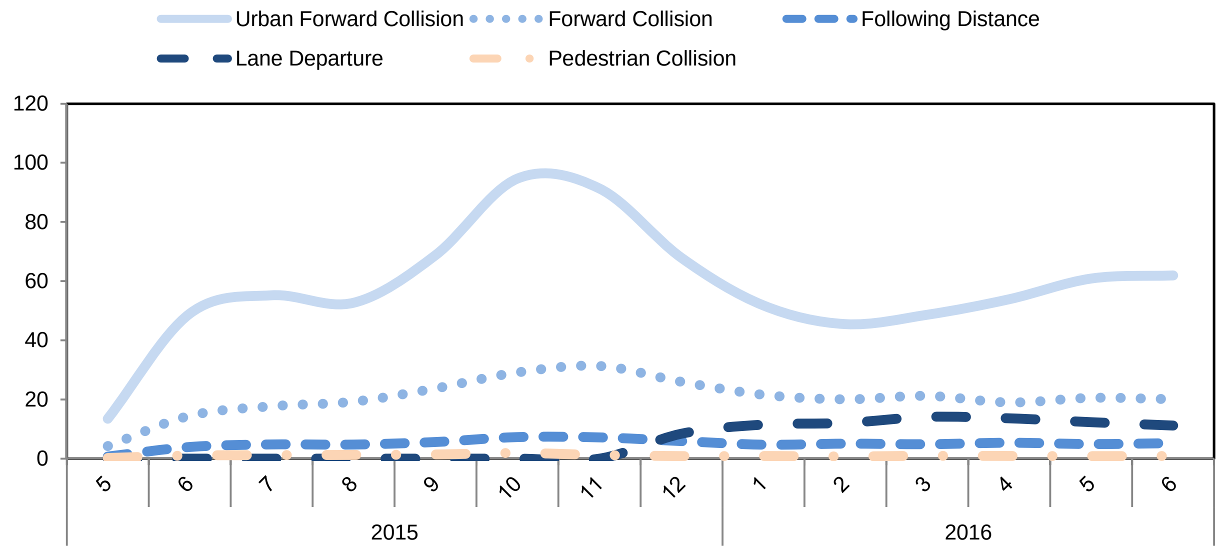
One of the alerts generated by the Mobileye systems included in IonFleets' solution follows a different pattern. Starting in September 2015, lane departure warnings spiked; however, lane departure warning levels have fallen significantly in the eight months following this spike in alerts, falling below even initial alert levels.



Mobileye

Mobileye's TLC Partners remained consistently active over the course of the Pilot—in fact, the group drove more miles per month in each month than in the last. Mobileye's fleet comprises primarily yellow taxis operated by a garage, so vehicles are not necessarily driven by the same driver from day to day. While this has the positive effect of exposing more drivers to the alerting system, a positive, the current level of data being reported to the TLC does not allow for monitoring driver behavior over time.

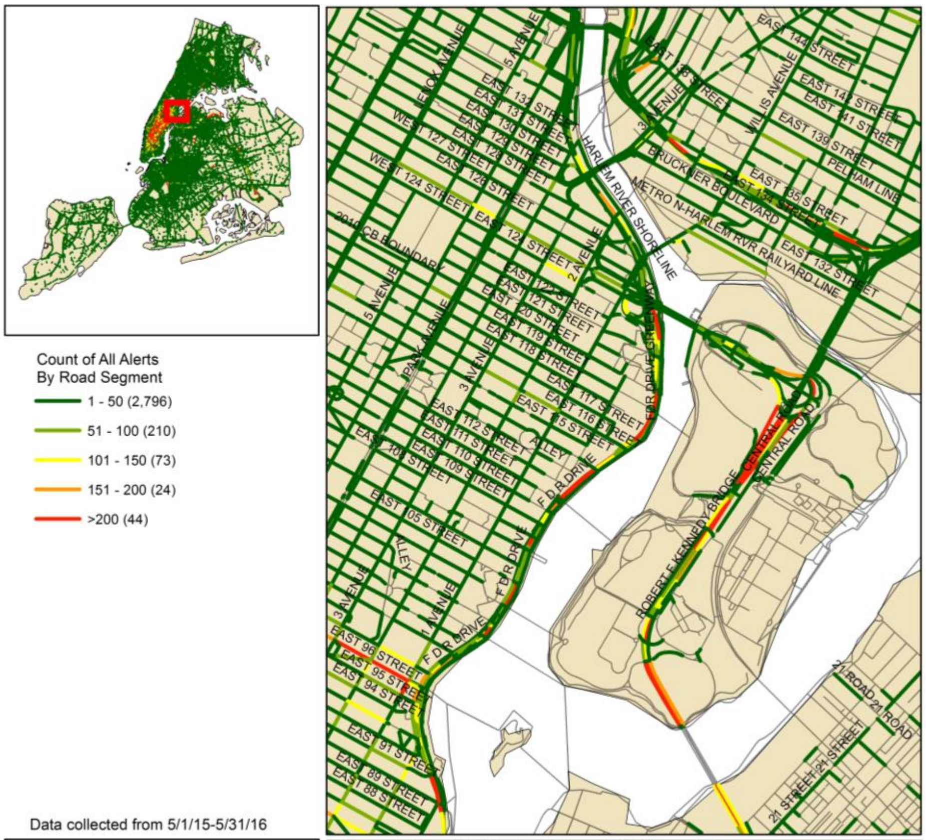
Figure 12: Mobileye Alerts per 100 Miles Driven



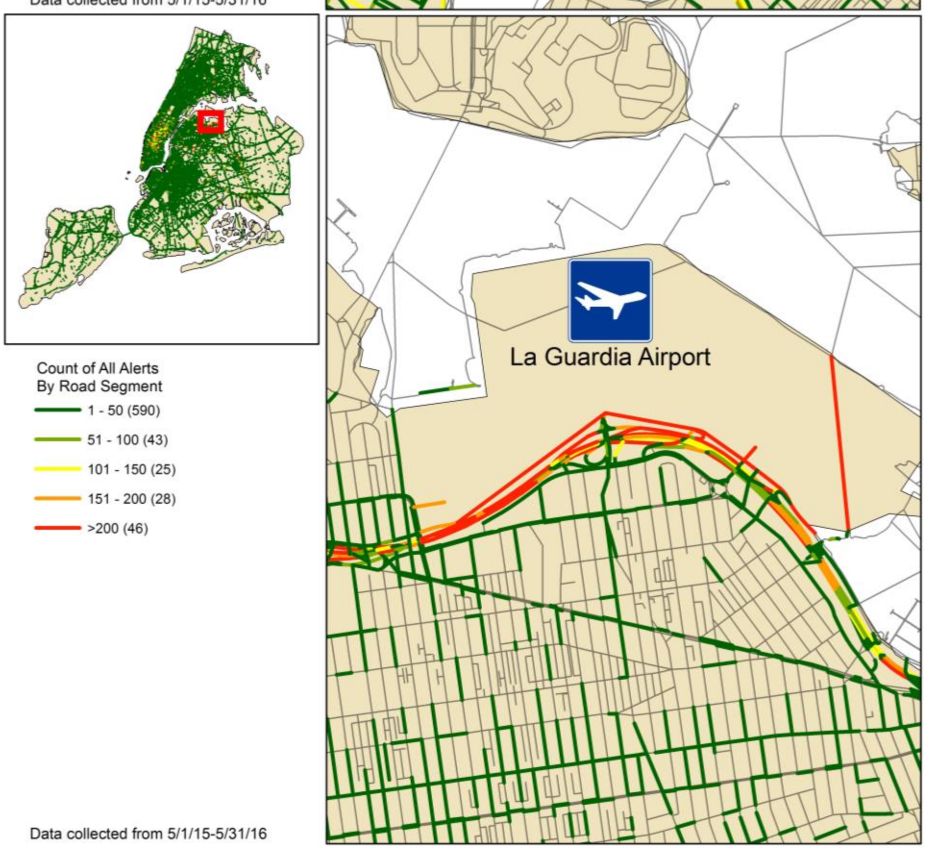
Mobileye's system issued nearly one million alerts over the course of one year. By far, the most common of those alerts was the Urban Forward Collision Warning, which accounted for 64% of all alerts. The alert is triggered when, at low speeds, a vehicle closely approaches the vehicle in front of it. Based on the purpose of this alert, the clustering observed when it is mapped makes sense: many of these alerts are found along major roads, highways, and entrance/exit ramps to tunnels and bridges. Especially in New York, where space is at a premium, queues that form at the entrances to bridges, tunnels, and airports require drivers to leave less space between cars than would be considered safe or normal in less dense environments.

This pattern is especially apparent on the Grand Central Parkway near LaGuardia Airport and along the Robert F. Kennedy/Triborough Bridge at the tollbooths for drivers leaving Queens and the Bronx. Maps 1 and 2 below show detailed views of alerts that occurred in those areas.

Map 1 and 2: Mobileye Alerts



Data collected from 5/1/15-5/31/16



Data collected from 5/1/15-5/31/16

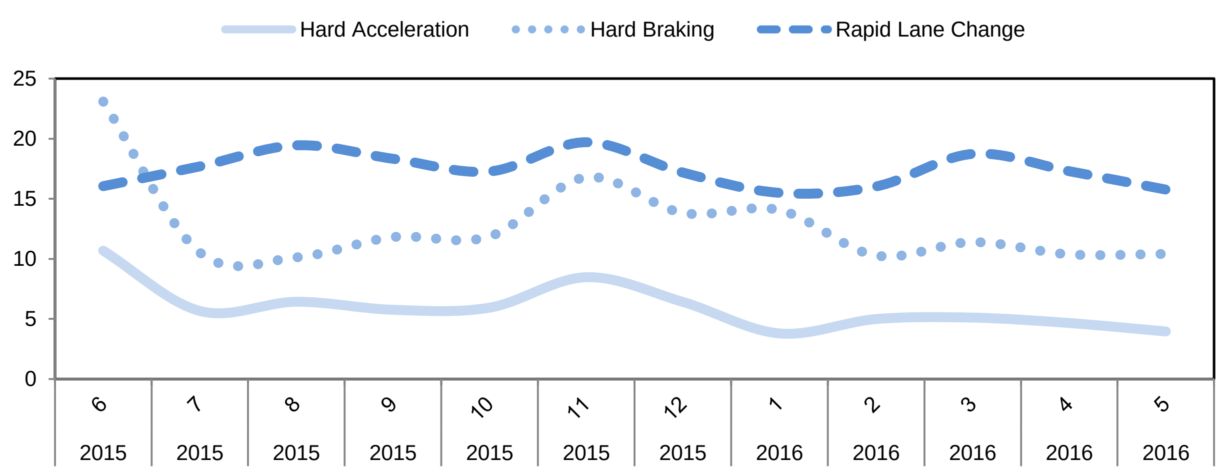
Datatrack247

Like IonFleets, Datatrack247 also has two waves of vehicles participating in the Pilot. The first, a group of 12 FHVs, has been participating in the Pilot since June 2015. Figure 13 below shows the driving events logged in those vehicles over the course of the Pilot. The data are normalized by the number of miles driven per vehicle, showing the total events per 100 miles driven by the participating vehicles.

Datatrack247 provides a view into the effect of alerts by alternating periods of activating and deactivating alerts. During the first 30 days of Datatrack247's pilot, black boxes logged events without producing alerts. Once alerts began to be generated in July, events dropped 32%. In August, after another month, alerts were turned off for drivers demonstrating good driving behavior, and in October, after four months, alerts were turned off for the entire pool of drivers. Since that time, if a driver's event rate rises above 75 events per week, alerts are reactivated the following week. Conversely, if the alert rate falls below 75 per week, the alerts are deactivated.

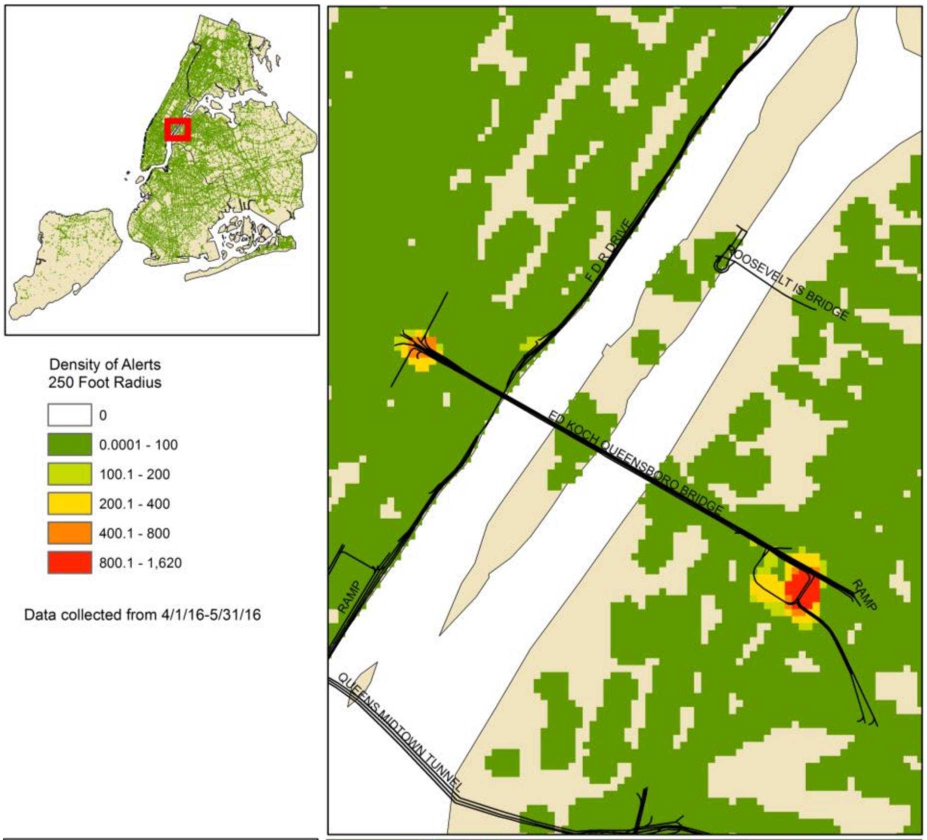
The monthly data displayed below shows the initial drop in events after alerts were introduced, and the increase in measured events when alerts were turned off. In the case of these 12 vehicles, there does appear to be a inverse correlation between active alerts and the number of events that the system measures (hard braking, hard accelerating and rapid lane changing). The recent expansion of Datatrack247's pool of TLC Partners should serve to enforce this observation and allow TLC to draw stronger conclusions about the usefulness of alerts.

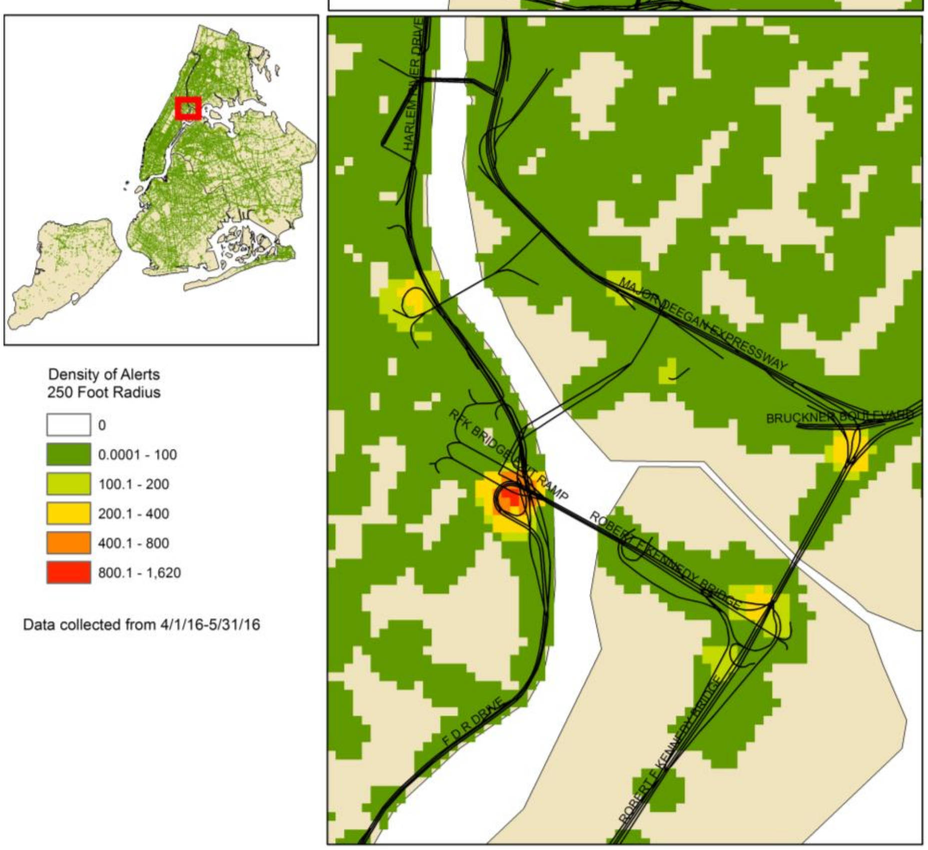
Figure 13: Datatrack247 Events per 100 Miles Driven



Recently Datatrack247 began providing TLC with data from nearly 230 TLC-licensed vehicles. While it is too early to begin to analyze how alert levels in these vehicles have changed over time, TLC staff began mapping these alerts. Again, entrances and exits to bridges proved to be hot spots, especially the Ed Koch/Queensboro and Robert F. Kennedy/Triborough Bridges. The overwhelming majority of these alerts were for rapid lane changes and hard braking, likely indicative of the dense traffic in the queues to enter the bridge, the tight turns required to exit the bridges, and the dense city traffic into which the bridges lead.

Map 3 and 4: Datatrack 247 Events



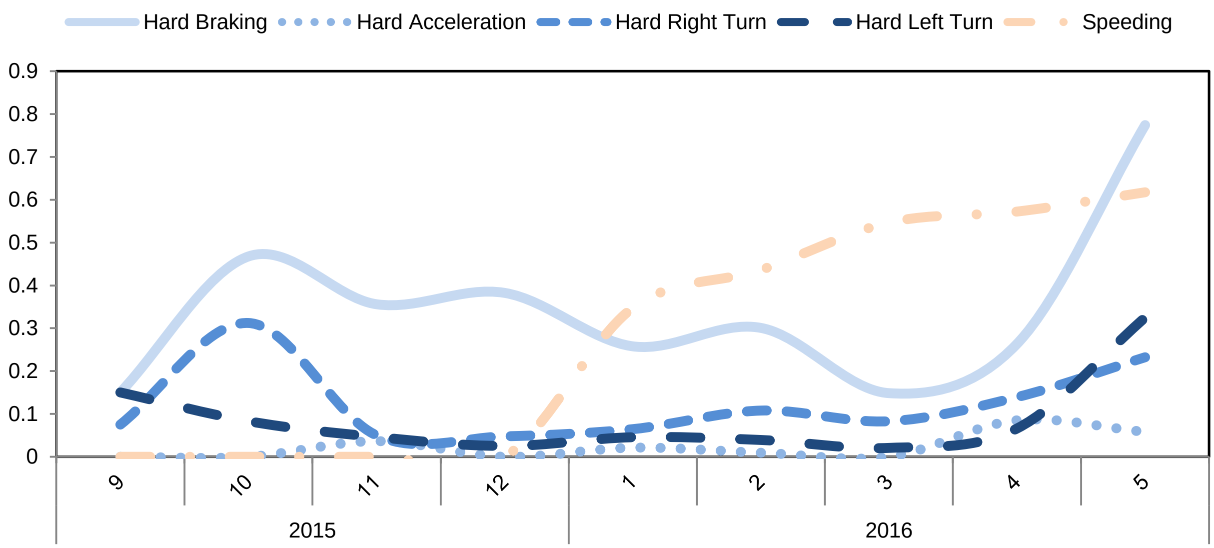


VerifEye

VerifEye, new to the Pilot since the first report, issues driver alerts based on g-force events (i.e. hard braking, hard acceleration, and hard turns) measured in the vehicle. The company also uses GPS data to create speeding alerts in areas where they believe GPS data can be reliably used to measure speed and where a need to measure speed has been identified. Because of higher thresholds required to trigger its alerts, VerifEye issued just 1,913 alerts to participating drivers in nearly 9 months of data collection.

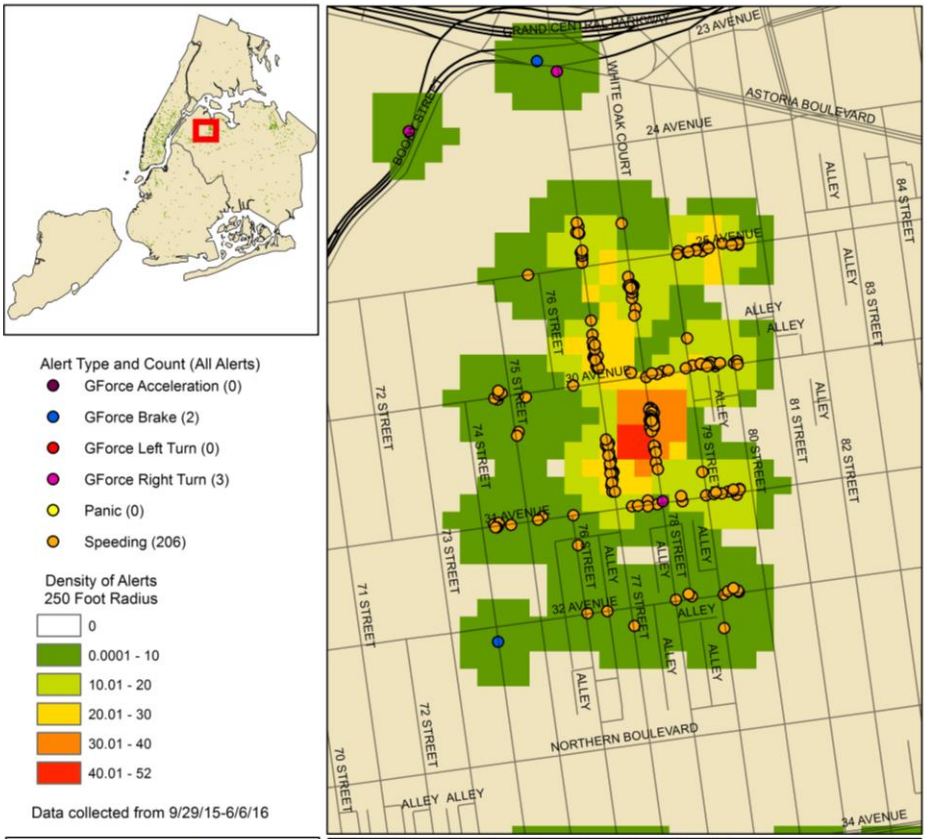
Figure 14 below displays the amount of alerts participating vehicles have received normalized by the number of hours they have been on the road. The traditional black box alerts went into effect at the same time that VerifEye entered the Pilot. Those alerts, especially hard braking, have decreased over time in the Pilot. However, in recent months, those alerts began to rise quickly. VerifEye began monitoring speeding in January 2015. In the five months that they have been active, speeding alerts per hour have steadily climbed. TLC will watch to see whether drivers begin to adjust their behavior in response to these alerts.

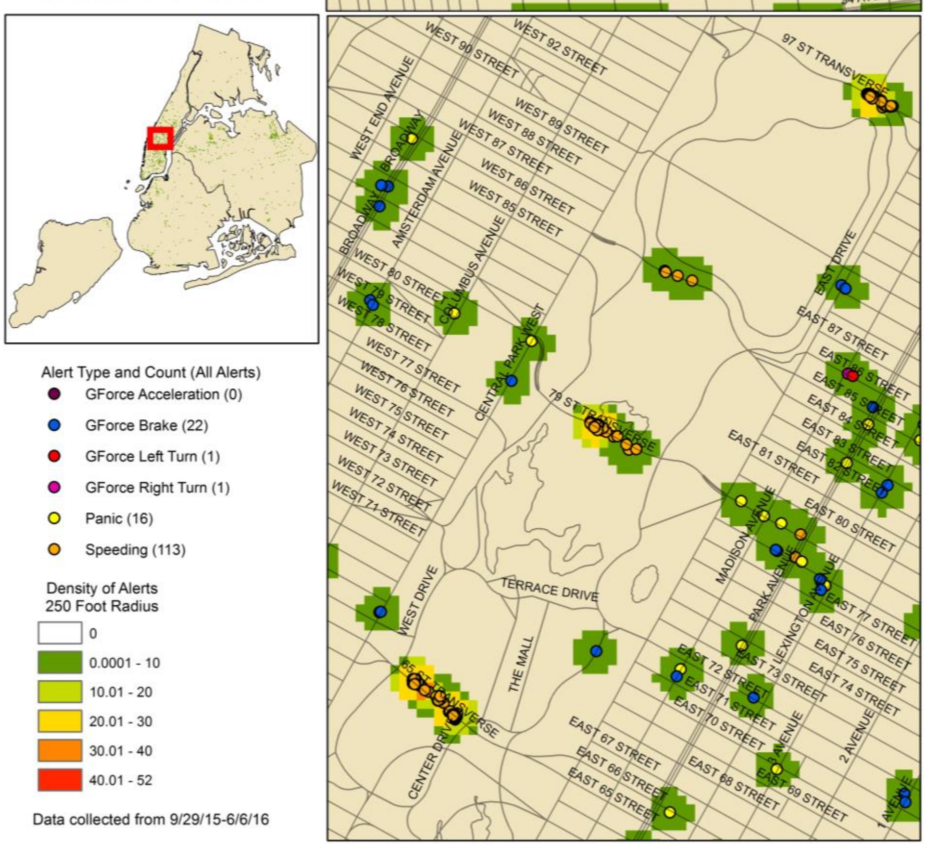
Figure 14: Verifeye Alerts per Hour on the Road



Speeding events, the bulk of the events recorded by the VerifEye system, tended to be clustered on the Queens Midtown Expressway and the entrance to the Long Island Expressway. The vast majority of these drivers (over 90%) were going 10 mph or less over the speed limit. TLC also noticed that there are clusters in speeding alerts in several residential neighborhoods, including in the section of Jackson Heights shown in Map 5, and along the transverses through Central Park as seen in Map 6.

Map 5 and 6: Verifeye Alerts

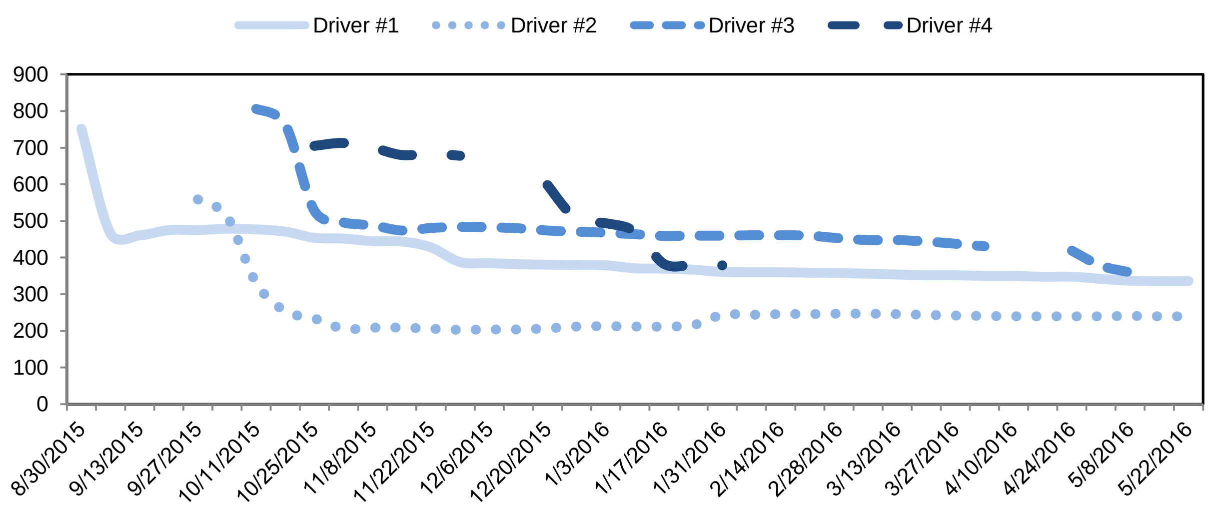




Micronet

Micronet does not provide drivers with alerts, nor does it record "events." Instead, the company's device constantly measures driving behavior in the vehicle, and updates a driver's score based on observed behavior. Factors that influence a driver's score include their tendency to hard-brake, hard-accelerate, or hard-corner. In Figure 15 below, driving scores for the four drivers participating in Micronet's pilot are graphed on a weekly basis. The drivers tend to begin with a high score, which indicates better driving, until they drop, and plateau, at a number that is about half of the original score. Micronet does not provide a threshold that drivers need to surpass to be considered a "good" driver. Instead, they encourage fleet managers to compare drivers in their fleet to other drivers in their fleet. As more data was collected from drivers, Micronet revised their scores down. This, in and of itself, does not necessarily indicate exceptionally poor driving—what can be drawn from the graph is that none of the four participating drivers stands is yet to stand out from the group as a bad or good driver. TLC will continue to monitor the crash rate for vehicles participating with Micronet equipment to understand how changes in driver scores may correlate with changes in crash rates.

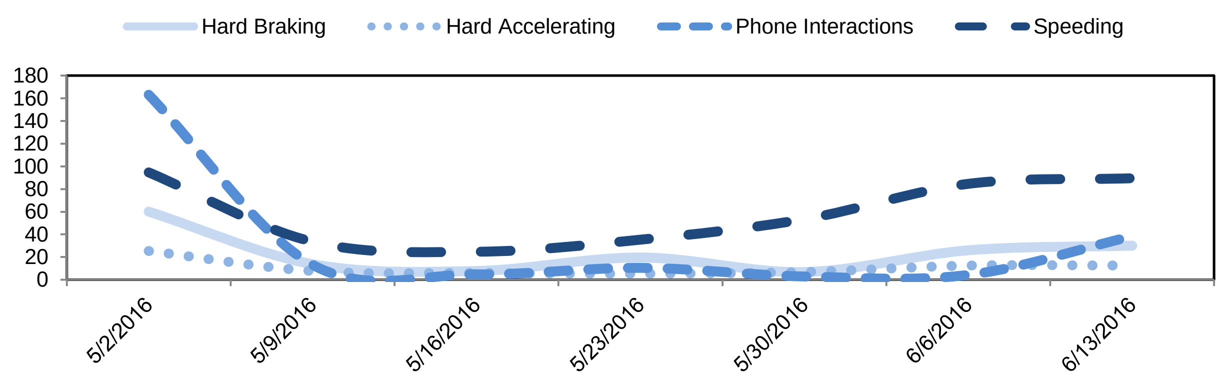
Figure 15: Micronet Driver Scores *(note: units of time are weeks, not months)*



Zendrive

In addition to capturing traditional driving events such as hard braking, hard accelerating, and speeding, Zendrive, which uses a smartphone-based system, can also measure a drivers' interaction with his or her smartphone while the vehicle is in motion, This ability is unique to the Pilot and should prove to be increasingly important for for-hire driving in an age of smartphone dispatch. In the graph below, Zendrive's alerts are displayed over time, normalized by the number of miles the fleet drove. After an initial drop-off in alerts seen in this graph, some alerts have begun to rise, possibly due to the addition of new drivers in later weeks. TLC will continue to monitor alerts issued by the Zendrive, which is a relatively new participant.

Figure 16: Zendrive Alerts per 100 Miles Driven *(note: units of time are weeks, not months)*



Brain Tree

Brain Tree, approved to participate in the Pilot shortly before analysis for this report began, has not begun reporting data to TLC. TLC will include analysis of the company's data in its subsequent report on the Pilot.

Effects on Expenses

Fee Schedules

Of the four Participants added since the first report, Zendrive provides the most inexpensive solution. Because the company has its TLC Partners use their own smartphone, the marginal cost of using its service is a $0 upfront cost, and a $2 monthly fee charged for the analytics the company provides. If the purchase price and the service plan for the smartphone is not to be included in the cost of using Zendrive, it is significantly less expensive than the other piloted systems.

Table 3: Costs per Participant

Participant	Initial Cost	Monthly Costs
IonFleets	$1,790	$70
Mobileye	$1,050 - $1,100	$28 - $35 (with black box)
DataTrack247	$450	$35
VerifEye	$785	$18
Micronet	$1,600 - $2,400	$35 - $75
Zendrive	$0	$2
Brain Tree	$799	$35

Insurance

Some insurance companies active in TLC-regulated markets offer policy discounts to vehicle owners who install black box and camera systems in their vehicles. TLC is not aware of any of those insurers basing policies on telematics data, but we understand that some VST participants are attempting to demonstrate their systems' capabilities to insurers in an effort to achieve additional insurance savings. TLC is aware that the New York State Department of Financial Services, the state agency in charge of approving new types of insurance, has expressed interest in approving insurance products that use telematics data in underwriting and for adjusting rates. While the TLC has no regulatory role in the insurance market, we will continue to monitor the potential impact of this Pilot's telematics data on vehicle insurance.

Passenger and Licensee Experience

Participant Feedback

Participants provided feedback about their experience with the VST Pilot through surveys and ongoing conversations. A common theme they have expressed is the initial reluctance of drivers to operate vehicles equipped with VST systems. Drivers primarily object to being monitored (by TLC or by a fleet manager) and to having driver alerts, which they fear will be annoying. According to some Participants, drivers are also averse to the idea of taking the vehicle off the road for the initial installation and for maintenance.

To address some of the concerns drivers raised, Participants have made modifications to their systems and to their operations. Some of these changes include reducing the volume of some audible alerts, and making adjustments to the installation process to decrease the amount of time it requires. By addressing drivers' concerns with these changes, Participants have experienced more success in signing up new drivers to use their systems.

With the extension of the Pilot, many Participants have also proposed adding more tools to their technology systems. Some of these additions would analyze changes in drivers' behavior to determine the impact of specific aspects of the system. Other proposed features would focus on precisely identifying fleet drivers during shift hours, which is especially helpful for vehicles that are operated by multiple drivers.

As the Pilot progresses, TLC will continue its conversations with the Participants and will monitor how the changes mentioned above affect drivers', fleets managers' and owners' reception of the technology. TLC would also like to get feedback about any changes VST has caused in vehicle operating costs.

Passenger Feedback

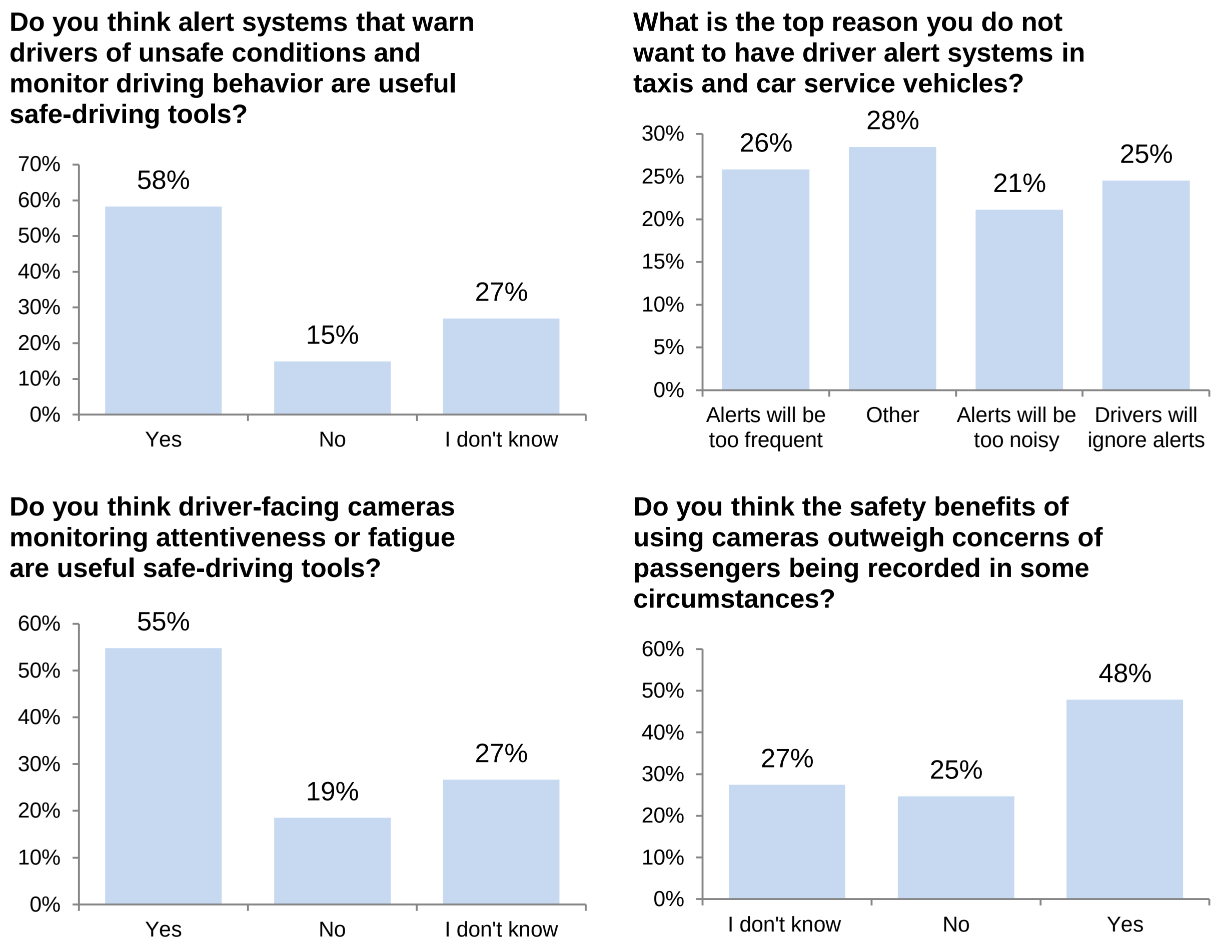
Input from the riding public is crucial to understanding the full effect of TLC's programs and pilots. For this Pilot, TLC made a survey available on the Passenger Information Monitor, which is the screen located in the back of yellow and green taxis. Over 60,000 passengers have responded to the survey.

Over half (58%) of those respondents indicated that they were in favor of using VST systems that deliver warnings about potentially dangerous behavior or roadway conditions in TLC-licensed vehicles. Fifty-five percent of respondents indicated that they think cameras could be useful tools for monitoring drivers' attentiveness to the road or their fatigue.

When asked about the drawbacks of using camera systems, 48% of respondents indicated that they thought the safety benefits of a camera system would outweigh their concerns about being recorded in the vehicle. Of the 15% of respondents who said they opposed using alert systems in TLC-licensed vehicles, nearly half stated that their primary concerns were about the nuisance of either having loud alerts or frequent alerts.

While initial results appear to generally favor the use of VST systems, the survey will remain available for the duration of the Pilot. TLC will continue to gauge passenger feedback and study areas of concern that have been identified.

Figure 17: Select Passenger Survey Results



Summary and Next Steps

The uniqueness of providing for-hire service in NYC has made this Pilot a challenging place to demonstrate the benefits of VST systems. The density of the city, accompanied by busy streets with multiple users, makes it difficult to apply typical alert thresholds, which may have originally been tailored to highway driving in less dense locations. With a multitude of options for drivers wishing to operate a vehicle for hire, many drivers choose the familiar over a vehicle with new technology, showing the importance of highlighting the benefits of these systems to drivers (and not just base or vehicle owners).

Collecting driver-specific data during the Pilot continues to be a challenge. The companies who have been the most successful at identifying which driver is in the vehicle at any given time have relied on the vehicle being owner-driven. One company is currently experimenting with issuing key fobs to drivers, which can be used to scan into a system, and another company has stated it intends to eventually use biometric scanning of fingerprints to identify specific drivers. However, as the scale of the Pilot continues to increase, the importance of tracking individual drivers' performance will diminish and our focus will shift to the behavior of the entire population of drivers in the Pilot.

TLC is looking forward to expanding the pool of participating vehicles, with a hope that more vehicles will allow clear trends to emerge in the Pilot data. In addition to monitoring alert trends and crash rates, TLC will focus more in the next report on driver acceptance of VST solutions through driver surveys and interviews.