Attachment A
Legistar File # 2019-0232

Los Angeles County
Metropolitan Transportation Authority
Office of the Inspector General

Bus Operator Safety Barrier Use and Effectiveness Study

Report No. 19-AUD-08

April 22, 2019

Metro

Los Angeles County
Metropolitan Transportation Authority

Office of the Inspector General
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Los Angeles, CA 90017

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April 22, 2019

Board of Directors

RE: Bus Operator Safety Barrier Use and Effectiveness Study (Report No. 19-AUD-08)

Dear Metro Board Members:

The Office of the Inspector General conducted a study on the use and effectiveness of bus operator safety barriers in partnership with ADS System Safety Consulting, LLC, an expert on transit safety.

Assaults on bus operators is an ongoing problem throughout the public transportation industry. Many agencies have implemented programs that include the use of bus operator safety barriers to reduce and/or prevent such assaults. Metro began installing barriers in 2015.

The purpose of this study was to evaluate the use and effectiveness of safety barriers, determine industry best practices, evaluate how employees and managers perceive the barriers, determine whether barriers have reduced assaults on bus operators, and obtain the opinions of bus operators, supervisors, and managers regarding the safety barriers. The study found that the bus operator safety barrier systems were generally effective in reducing the assault rate, but further actions are needed such as.

- Continue to install barriers and onboard camera systems.
- Standardize assault reporting to include whether the barriers was in use.
- Use assault trend analysis to review policing and security strategies and deployment.
- Study issues identified by operators as to why they do not use bus barriers, and consider options to address concerns.
- Make use of barriers mandatory.
- Review safety barrier and de-escalation training for any improvement.
- Continue strengthening preventive measures to combat operator assaults, including industry best practices.

We appreciate the assistance provided by Metro Operations staff during this study. I am available to answer any questions concerning this report.

Sincerely,

Karen Gorman
Inspector General

cc: Phillip Washington
James Gallagher
Vijay Khawani
Board Deputies

Los Angeles County Metropolitan Transportation Authority
(LA Metro)

Office of the Inspector General

BUS OPERATOR SAFETY BARRIER USE AND EFFECTIVENESS STUDY

Submitted by
ADS System Safety Consulting, LLC

April 5, 2019

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Executive Summary

Assaults on bus operators is an ongoing problem throughout the public transportation industry. In response, many agencies throughout the United States, Canada, and Europe have implemented programs that include the use of bus operator safety barriers to reduce and/or prevent such assaults.

In 2015, the Los Angeles County Metropolitan Transportation Authority (Metro) began installing bus operator safety barriers throughout its bus fleet. This study, undertaken by LA Metro's Office of the Inspector General (OIG), has been conducted to evaluate the effectiveness of these barrier systems in preventing assaults on Metro's bus operators, evaluate how employees perceive the safety barriers and their effectiveness, and identify industry best practices. The study included:

1. Collecting and analyzing historical data provided to identify trends.
2. Conducting Metro Bus Operator surveys created specifically for this study.
3. Conducting Metro Supervisor and Manager surveys created specifically for this study.
4. Conducting industry surveys of other public transportation agencies that use safety barriers on their buses.
5. Reviewing industry specific documents developed by the Transportation Cooperative Research Program (TCRP) relevant to the study.
6. OIG field observations of operator use of safety barriers.

The data collected from each of these activities was analyzed to identify trends within Metro and similar agencies. This included evaluating the effectiveness of the bus operator safety barrier systems in reducing assaults on Metro's bus operators; identifying industry best practices; identifying bus operator concerns and issues regarding the barriers; gathering feedback from bus Supervisors and Managers; and evaluating training programs associated with the safety barriers and the prevention of assaults on Metro's bus operators. Findings include:

1. Safety barriers and onboard camera systems appear to be effective deterrents to assaults on bus operators.
2. Data pertaining to the bus operator safety barriers is inconsistently collected by stakeholders.
3. Assaults occur more frequently on bus routes 4, 204, 720, 207, and 40 than others, during the afternoon hours of 1:00 pm to 5:00 pm, and most predominantly as a result of fare disputes.
4. Metro's bus operators do not consistently use the safety barriers.

5. Although most of Metro's bus operators, Supervisors and Managers believe the safety barriers are effective in preventing assaults, nearly half believe other additional protective measures are needed.

6. Metro's training programs pertaining to the use of the safety barriers and de-escalation of disputes training could be improved or increased.

7. Metro's experiences with assaults on its bus operators and the actions it is taking to prevent these types of incidents is consistent with other transit properties.

Seven recommendations have been made in response to these findings and are contained in the body of the report and summarized in Appendix H.

1.0 Introduction

Assaults on bus operators is a continuing issue for public transit providers throughout the United States, Canada and abroad. The underlying causes of these assaults are complex with no "silver bullet" available to completely prevent their occurrence. Factors such as socioeconomic status, mental health, service demands, and other environmental conditions can all contribute to their occurrence. Alone, these incidents undermine the ability of transit agencies to ensure safe and reliable transportation service. Collectively, however, they set the stage for what may be considered at times a volatile operating environment. As such, many of the nation's transportation officials are perplexed as to what can be done to better protect their employees and passengers from incidents.

The seriousness of this issue has been recognized by the nation's lawmakers, Congressman Ro Khanna of California's 17th district, Congresswoman Grace Napolitano of California's 32nd district, and Congressman John Katko of New York's 24th district, who in 2018 co-sponsored the *Bus Operator and Pedestrian Protection Act*. This proposed Act required the installation of protective shields (i.e., bus operator safety barriers), training to de-escalate violent situations, and would require transit agencies to track and report the number of assaults and violent acts against their bus operators to the U.S. Department of Transportation.

The U.S. Department of Transportation has also recognized the severity of this issue, tasking the Transportation Research Board (TRB), which is sponsored by the Federal Transit Administration (FTA), to complete two Transit Cooperative Research Program (TCRP) studies of the issue. These are *TCRP Research Report 193: Tools and Strategies for Eliminating Assaults Against Transit Operators*; and *TCRP Synthesis 93: Practices to Protect Bus Operators from Passenger Assault*.

In response to this issue, in 2015 the Los Angeles County Metropolitan Transportation Authority (LA Metro) began a pilot program to evaluate and test the use of bus operator safety barriers on its bus fleet. The pilot program also included a survey, completed between April 2015 and August 2015, to examine how Metro's bus operators felt about the use of the safety barriers. The initial surveys completed during this pilot program indicated that just over half of the bus operators surveyed felt that they would use the barriers; the barriers made their jobs easier; they felt somewhat safe with the barriers in place; and they felt somewhat safe with the new onboard video monitoring system that was being tested at the same time as the barriers. Metro began fleet-wide installation of the bus operator safety barriers in 2015 following the completion of the pilot program. LA Metro operates about 2,300 buses and employs about 3,800 bus operators who are assigned to 11 divisions located throughout the County of Los Angeles.

After three years of implementation and use, the LA Metro Office of the Inspector General (OIG) began a *Bus Operator Safety Barrier Use and Effectiveness Study* to determine whether the use of the safety barriers is effective in enhancing safety and providing operators with an enhanced perception of security. The study began in December 2018, at which time safety barriers had been installed in approximately half of Metro's bus fleet. In addition, all new bus procurements are required to be equipped with the bus operator safety barrier systems.

This report presents the methodology used to complete the study, data analysis results, and key findings and recommendations. Because of the large amount of data collected and analyzed for the study, Appendices A through D provide additional analysis results, including charts and graphs. These appendices include:

- **Appendix A**: Historical Data Analysis Charts and Graphs
- **Appendix B**: Bus Operator Survey Analysis Charts and Graphs
- **Appendix C**: Bus Supervisor / Manager Survey Analysis Charts and Graphs
- **Appendix D**: Industry Survey Analysis Charts and Graphs

1.1 Purpose and Objectives

The purpose of the *Bus Operator Safety Barrier Use and Effectiveness Study* was to determine whether the use of the safety barriers is effective in enhancing safety and providing bus operators with an enhanced perception of security. Objectives of the study included:

1. Evaluating the effectiveness of the bus operator safety barrier systems in reducing assaults on operators;

2. Determining industry best practices concerning the implementation and use of bus operator safety barriers;

3. Determining bus operator experiences and perceptions of enhanced security and the effectiveness of the Bus Operator safety barriers, including reasons operators were not using the barriers; and

4. Surveying Supervisors and Managers to obtain their views on the implementation and effectiveness of the Bus Operator safety barriers.

1.2 Description of Bus Operator Safety Barrier System

Metro's current bus operator safety barriers consist of two parts. An upper barrier, shown in **Figure 1.2.1**, designed to protect the bus operator's upper body, and a lower barrier, shown in **Figure 1.2.2**, designed to protect the bus operator's lower body. Each portion of the barrier can be used independently or together, as shown in **Figure 1.2.3**, at the discretion of the bus operator. The safety barriers are intended to protect the bus operators while still allowing access to the fare box and communication with passengers. **At this time, use of the safety barriers is voluntary as Metro does not currently have a policy regarding their use**.

Figure 1.2.1: Top Barrier Engaged

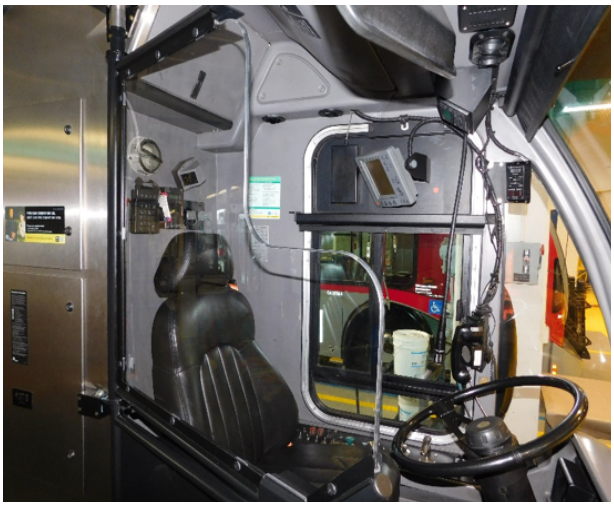


Figure 1.2.2: Bottom Barrier Engaged

Figure 1.2.3: Driver View Through Barrier

Figure 1.2.4: Both Barriers Engaged

Note: For the barrier systems installed by Metro, the lower portion of the barrier must be closed in the "used position" because it only opens 90 degrees, and thus would block the aisle for passengers.

2.0 Study Methodology

The *Bus Operator Safety Barrier Use and Effectiveness Study* was completed using a comprehensive methodology that included:

1. Collecting and analyzing historical data provided to identify trends. Data analyzed included:
   - Assault data recorded by both the Los Angeles County Sheriff's Department and Los Angeles Police Department;
   - Metro assault data;
   - Metro data on the installation of the safety barriers;
   - All 11 Metro Bus Divisions and bus route data;
   - OIG field observation data regarding safety barrier use; and
   - Metro and Los Angeles Sheriff and Police Department assault investigations data.
2. Conducting Metro Bus Operator surveys created specifically for the study.
3. Conducting Metro Supervisor and Manager surveys created specifically for the study.
4. Conducting industry surveys of other public transportation agencies that use safety barriers on their buses.
5. Reviewing industry specific documents developed by the Transportation Cooperative Research Program (TCRP) relevant to the study, including:
   - Report 193: Tools and Strategies for Eliminating Assaults Against Transit Operators.
   - Synthesis 93: Practices to Protect Bus Operators from Passenger Assault.
6. Analyzing the results of the OIG's field observations of bus operator use of safety barriers.

Each of these data sources provided both data to interpret, as well as personal perspectives on the effectiveness of the safety barriers from different points of view within the transit industry. The data collected from each of these sources, excluding the TCRP documents, was analyzed to determine if there were specific correlations between the use of the barriers, various assault characteristics, and personal characteristics of the bus operators.

Trend analyses were also performed to identify trends across various quantitative and qualitative categories and measures such as age, gender, bus route, bus division, years of experience, and usage of the safety barriers. Other factors analyzed included bus operator perceptions of safety and the effectiveness of the safety barriers, effectiveness of training programs, and issues involving the use of the barriers. The analysis of these quantitative and qualitative factors provided results that have been used to identify findings and recommendations, and to draw conclusions about the use and effectiveness of the bus operator safety barriers.

3.0 Analysis of Historical Incident Data

Historical data involving assaults on Metro bus operators between the years 2010 and 2018 was collected and analyzed to identify past incident trends. The analysis of assault data during this time period was completed to evaluate the frequency of assaults before (i.e., between 2010 and 2015) and after (i.e., 2015 to 2018) bus operator safety barriers systems began to be installed on Metro's bus fleet. The graphs below illustrate some of the more significant trends identified during the analysis.

Figure 3.0.1 illustrates the trend of assaults spanning the last nine years (2010 to 2018). There was an increase in assault frequency from 107 to 153 beginning in 2010 through 2015. When the safety barriers began to be implemented, assault frequency then decreased between 2016 through 2018 from 111 to 80. Because the safety barriers began to be installed in 2015, it may be surmised that the safety barriers have been effective in reducing passenger assaults on bus operators. However, this conclusion is ***not*** entirely clear, as on-board camera systems (which also serve as a deterrent to passenger assaults on operators) to monitor and record passenger behavior on Metro's bus fleet also began to be installed at this time. In addition, in 2015-2016, the Metro OIG issued a report recommending law enforcement deployment modifications. Changes in the law enforcement and security department also occurred. These factors may have also contributed to reducing the frequency of assaults on Metro's bus operators.

In addition, policing and incident investigation of Metro's bus operations was partially transitioned from the Los Angeles County Sheriff's Department to the Los Angeles Police Department during this period of time. As a result, the data collected from each Department was inconsistent with regard to barrier use and assault type. Inherent differences also exist between the policing methods used by each Department, including where and how resources are deployed to police Metro's bus operations.

Therefore, the decrease from 153 to 80 operator assaults between 2015 and 2018 cannot be directly attributed solely to the installation of the bus operator safety barrier systems and cannot be accurately determined. Rather, the decrease in assaults between 2015 and 2018 may be the result of barrier installation and use, the presence of onboard camera systems, increased police presence, training, or a combination thereof. Whatever the contribution of operator safety barriers may be, the combination of factors is working well.

Figure 3.0.1

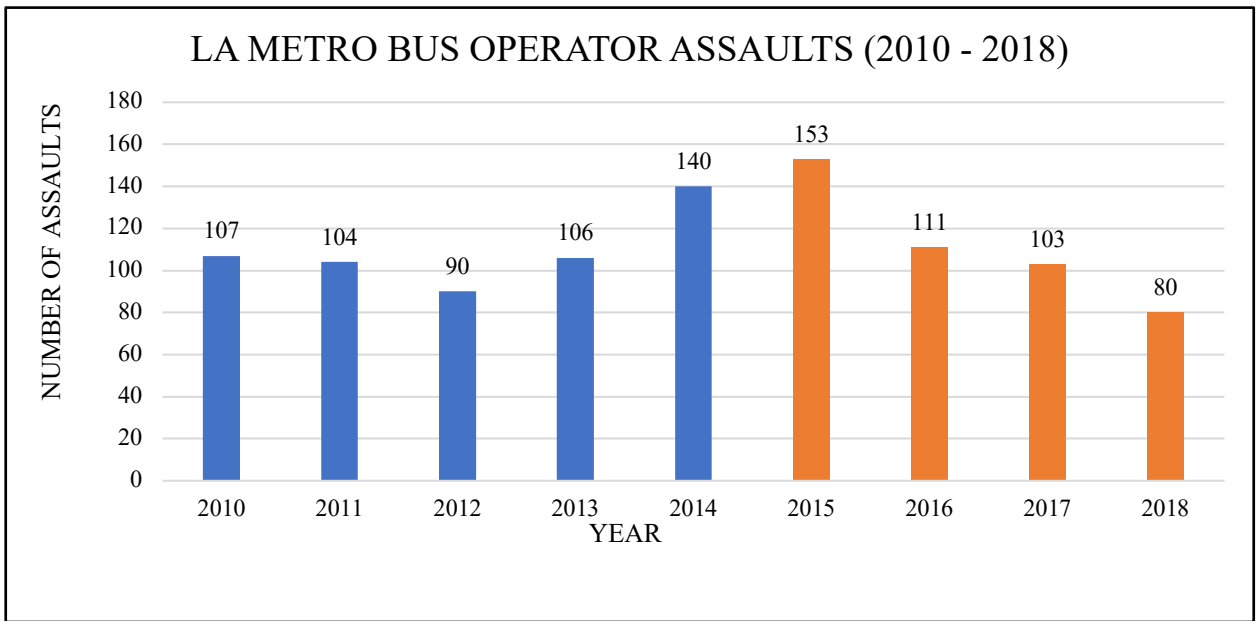


Figure 3.0.2 depicts the number and top five types of assaults that took place from 2015-2018. Two types of assaults, (1) Bus Operators Being Hit or Punched and (2) Bus Operators Being Spat On make up the majority of the assaults. This trend is consistent with what other transit properties experience.

Figure 3.0.2

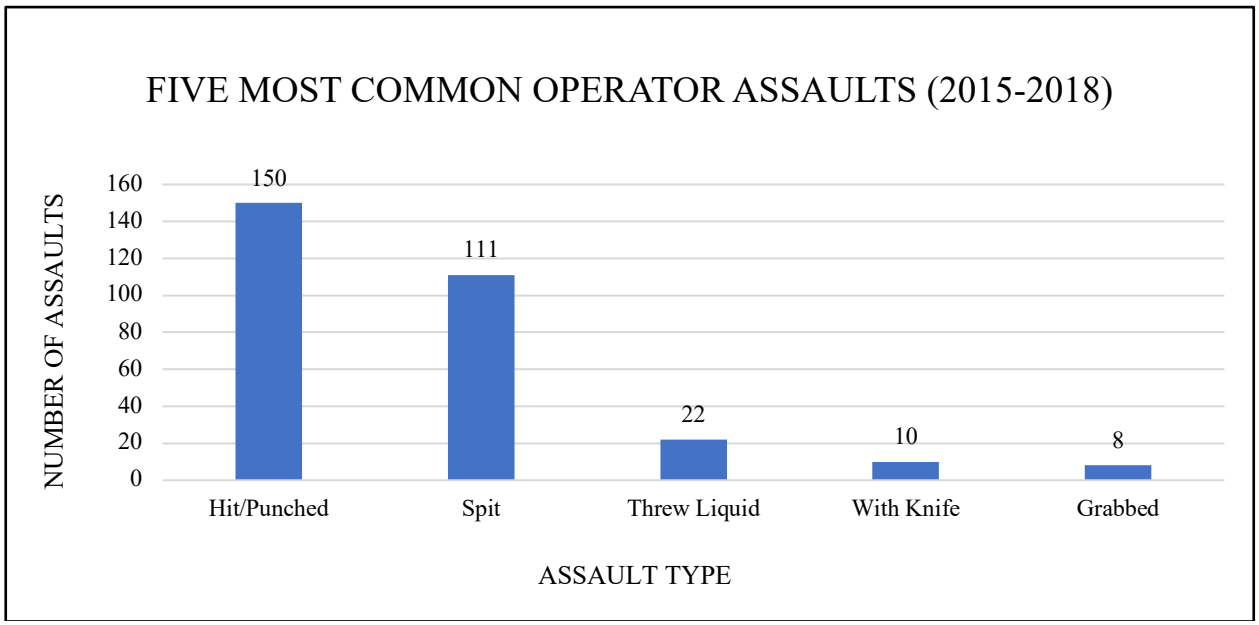
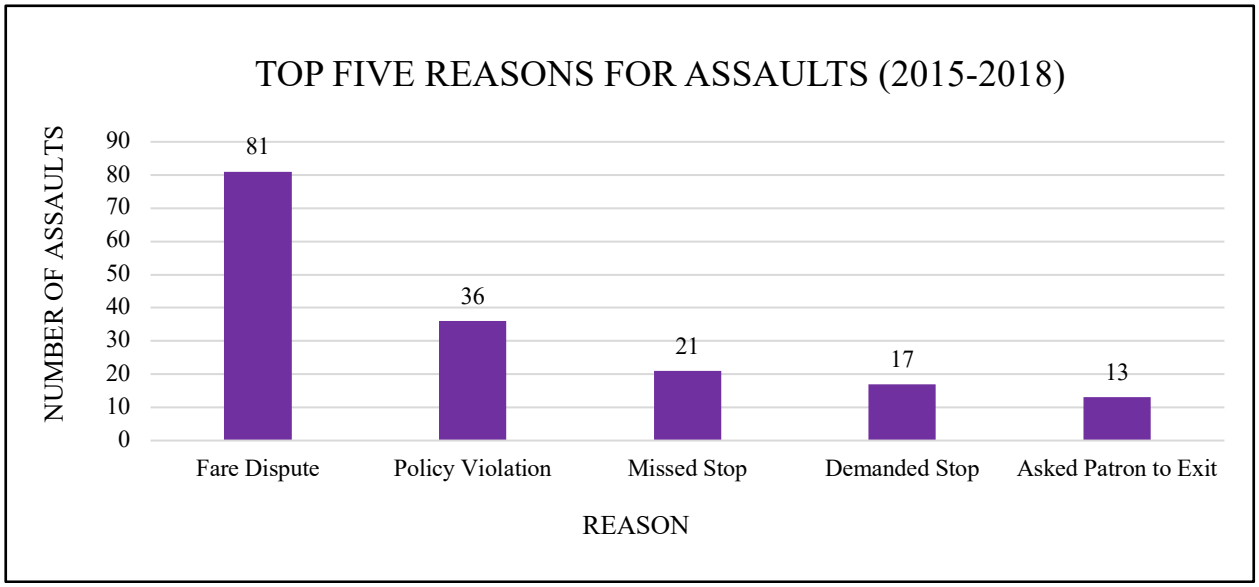


Figure 3.0.3 depicts the top five reasons cited as topics related to assaults, with fare disputes being most prevalent. Typically fare disputes are exchanges between the bus operator and customer regarding non-payment of fare, not having the correct fare, issues about transfers, and/or communication techniques used during these exchanges (i.e., hostile or confrontational communication).

Contributing factors to fare disputes must be investigated thoroughly to fully understand the dynamics of the situation that took place, and how it escalated to the point where an assault occurred. How customers present themselves to the bus operator and how the bus operator participates in the interaction needs to be examined to determine how the actions of both parties escalated the situation. Both factors determine how the situation plays out, and whether the result is positive or negative. De-escalation training is a common mitigation used across the transit industry to combat these types of assaults.

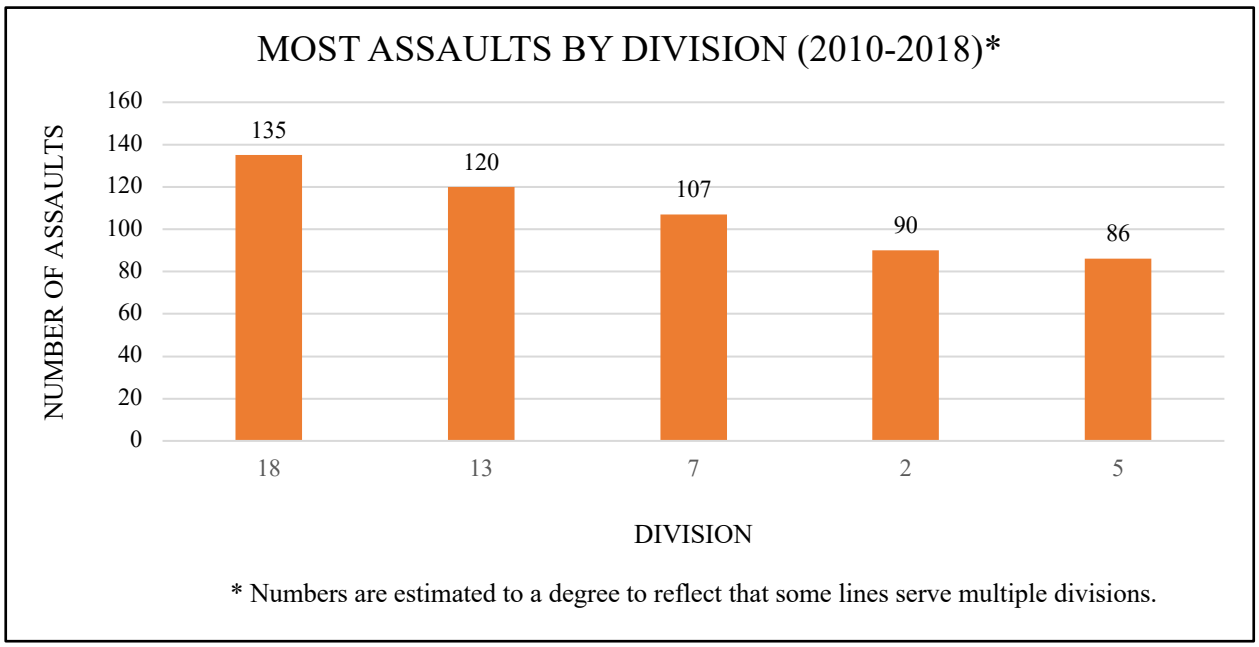
The analysis determined "Policy Violations" as being the second most frequent reason for assaults. Issues that were categorized as policy violations, or violations of the "Customer Code of Conduct," include bus operators addressing a customer for playing music too loudly on the bus, bus operators addressing passengers for disrupting other passengers or inhibiting the safe operation of the bus, or passengers refusing to comply with requests from the bus operator to behave according to the Customer Code of Conduct.

Figure 3.0.3



For all 11 divisions, there were 994 operator assaults between 2010 and 2018 (see Figure 3.0.1). **Figure 3.0.4** provides a breakdown of the divisions that had the highest number of assaults. The top five divisions (Divisions 18, 13, 7, 2 and 5) had a total of 538 from 2010 through 2018. Identification of the divisions that experience the highest number of assaults is important in order to develop policing strategies such as targeted policing and fare enforcement missions.

Figure 3.0.4



A further breakdown of assaults by bus line is illustrated in **Figure 3.0.5**. From 2010-2018, the top five lines with the most assaults were lines 4, 204, 720, 207, and 40. The graph shows the top ten lines with the most assaults to provide a more detailed analysis across multiple lines.

Figure 3.0.5

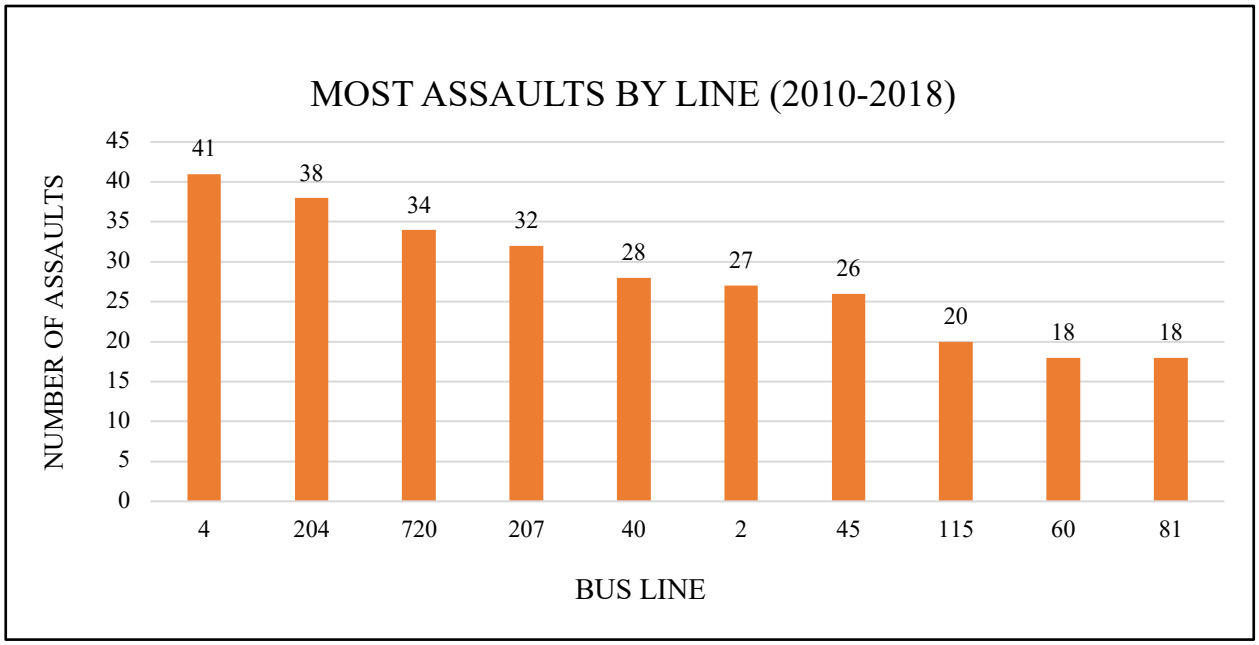
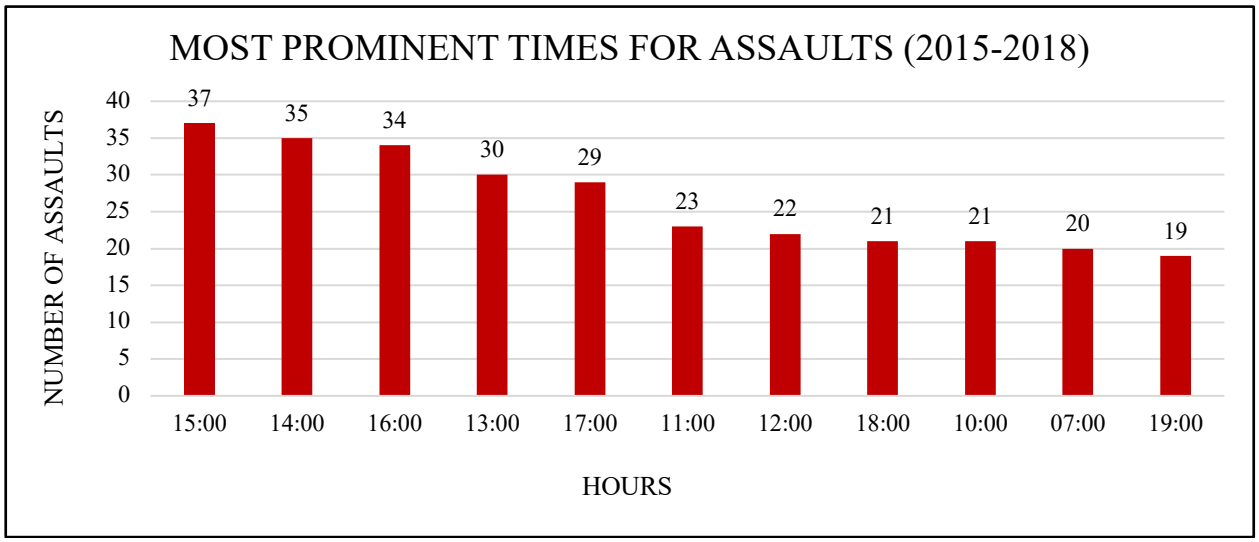


Figure 3.0.6 shows that most of the assaults that took place between 2015 and 2018, took place in the afternoon between the hours of 13:00 and 17:00 (i.e., 1:00 pm and 5:00 pm). This is an important statistic to consider for the deployment of police, Supervisors, and conducting fare enforcement missions in an effort to quell assaults. Using this information, mitigation efforts can be directed to specific lines at certain times of the day for scheduling missions or showing police and supervisor presence on the buses. Understanding that resources are always a concern, targeted policing and enforcement tactics should be performed under a joint effort by both Metro and local law enforcement.

Figure 3.0.6



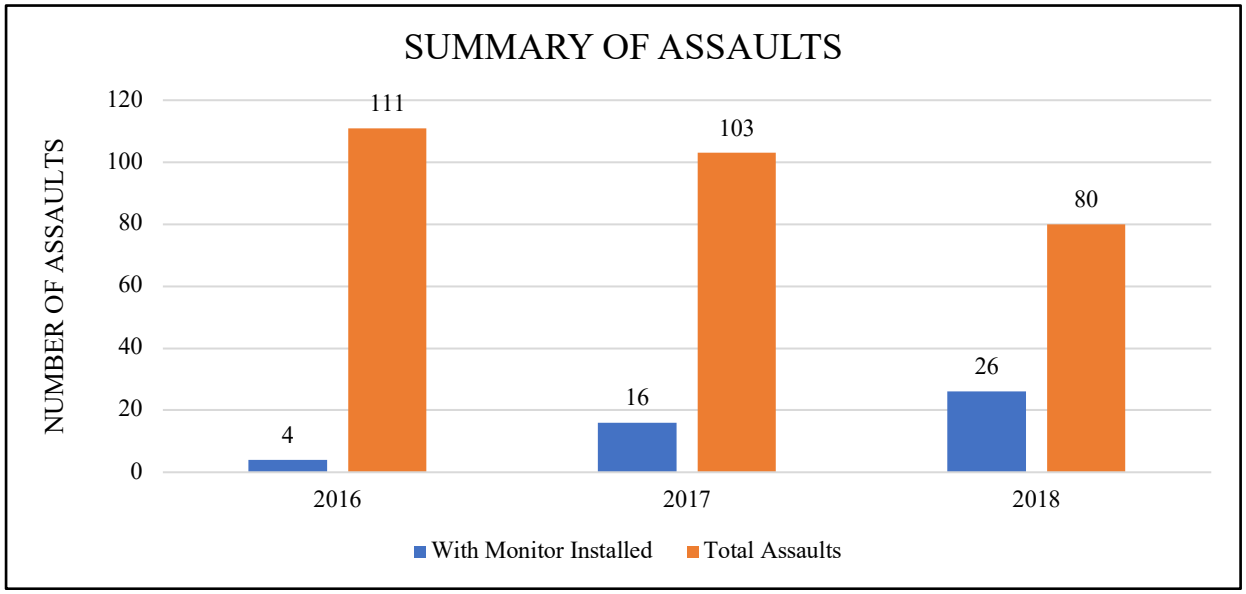
In addition to the installation of safety barriers, cameras with monitors are in the process of being installed on Metro's bus fleet. The use of cameras and monitors on board buses has been identified as an effective industry practice for preventing passenger assaults on bus operators. **Figure 3.0.7** illustrates the number of assaults on buses that occurred with and without monitors being installed since the monitors began being installed in 2016. As of March 29, 2019, nearly 1,000 buses in the Metro fleet had been outfitted with cameras and monitors.

As shown in **Figure 3.0.7**, while the overall number of assaults has decreased between 2016 and 2018, the number of assaults that have occurred on buses with cameras and monitors installed has increased. This finding can be interpreted as follows:

- The cameras and monitors are effectively contributing to the reduction in bus operator assaults (i.e., as more cameras and monitors have been installed, the overall number of assaults has decreased);
- Although the overall frequency of assaults has decreased between 2016 and 2018, the frequency of assaults occurring on board buses with cameras and monitors has increased. This is likely because in 2018 more buses were equipped with the cameras and monitors than in 2016 when only a few buses were equipped with cameras.

It is likely that this trend will plateau as installation of the cameras and monitors is completed throughout Metro's fleet, as there will always be a segment of the population that carries out assaults regardless of the presence of cameras and monitors. The decrease in assaults between 2016 and 2018 cannot be entirely attributed to the installation of the cameras and monitors. Rather, the decrease in assaults also may be the result of more barrier installation and use, increased police presence, training, or a combination thereof with cameras. All of these factors are important because transit riders may not notice the cameras or forget about their presence after they become angry about a matter or incident.

Figure 3.0.7



4.0 Analysis of Metro Bus Operator Survey Data

A survey of Metro bus operators was developed and conducted to gather operator feedback regarding the bus barrier safety systems. The survey, which is provided in **Appendix E**, was used to collect general demographic data with regard to age, gender and years of experience, as well as specific data with regard to use of the barriers, operator perceptions regarding the effectiveness of the barriers, challenges and issues inhibiting use of the barriers, and information about training on the use of the safety barrier and how to deal with volatile situations. The surveys were distributed to bus operators at all 11 Metro bus divisions. The bus operators were paid for ten minutes of their time to complete the surveys and the surveys were then collected and analyzed. In total, 333 surveys were collected.

As is experienced with most large-scale surveys, the following issues were identified with the bus operator survey responses:

- Not all surveys were completed in their entirety.
- Many bus operators chose not to answer certain questions. This could result in inaccurate trend analysis results.
- Some of the written responses contained suggestions that were not appropriate for the question being asked.

Table 4.0.1 identifies the survey question numbers and the number of responses to each that were missing or did not have complete responses.

Table 4.0.1

Bus Operator Surveys	
Question Number	**Number Missing Additional Information**
7. Barrier ease of use	6
8. Effectiveness of barriers	21
10. Would Correcting issues increase use of barriers	51
12. Selective use of barriers by line	17
15. Effectiveness of training regarding barriers	18
18. Effectiveness of de-escalation training	14
20. Mandatory vs. optional use of barriers	59
24. Other protective measures	29

Of the 333 total surveys collected, 8% were determined to be missing requested information. Despite these issues, sufficient surveys were collected to complete an analysis of bus operator responses. **Appendix B** provides additional graphs and charts produced as a result of the analysis. Based on the large non-response rate to the question of whether or not barrier use should be "mandatory vs. optional" it may be inferred that operators are reluctant or ambivalent about this issue.

Bus operator demographic data was first analyzed. Of the total number of respondents, 172 were male, 55 were female, and 106 bus operators did not respond (DNR) to the demographic data questions. Of all respondents, 305 were full-time bus operators, 21 were part-time bus operators, and 7 operators did not answer the question. **Figures 4.0.1** and **4.0.2** summarize the bus operator demographic results.

Figure 4.0.1

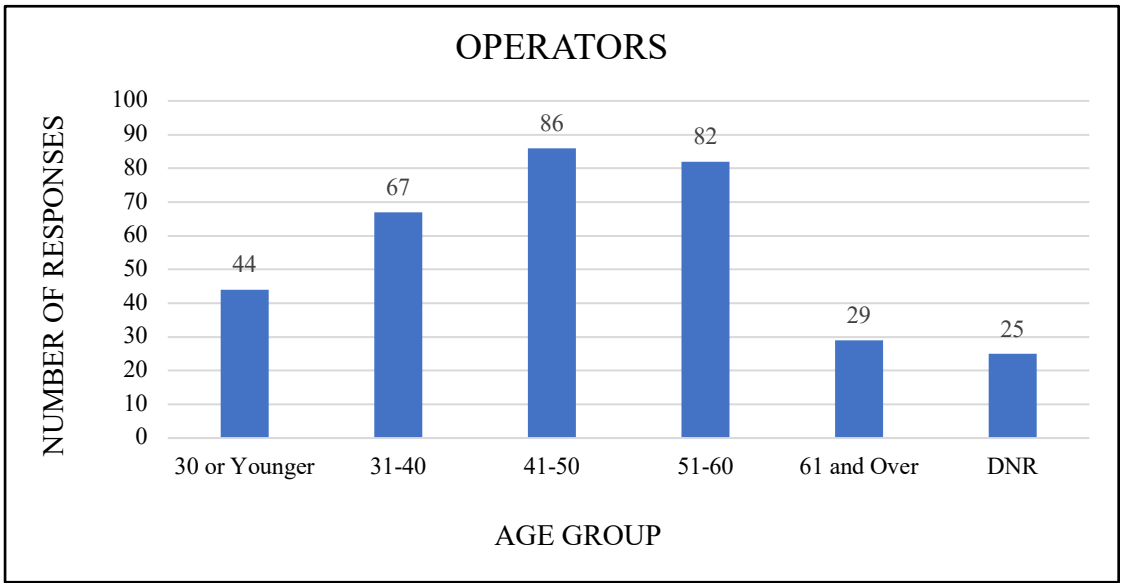
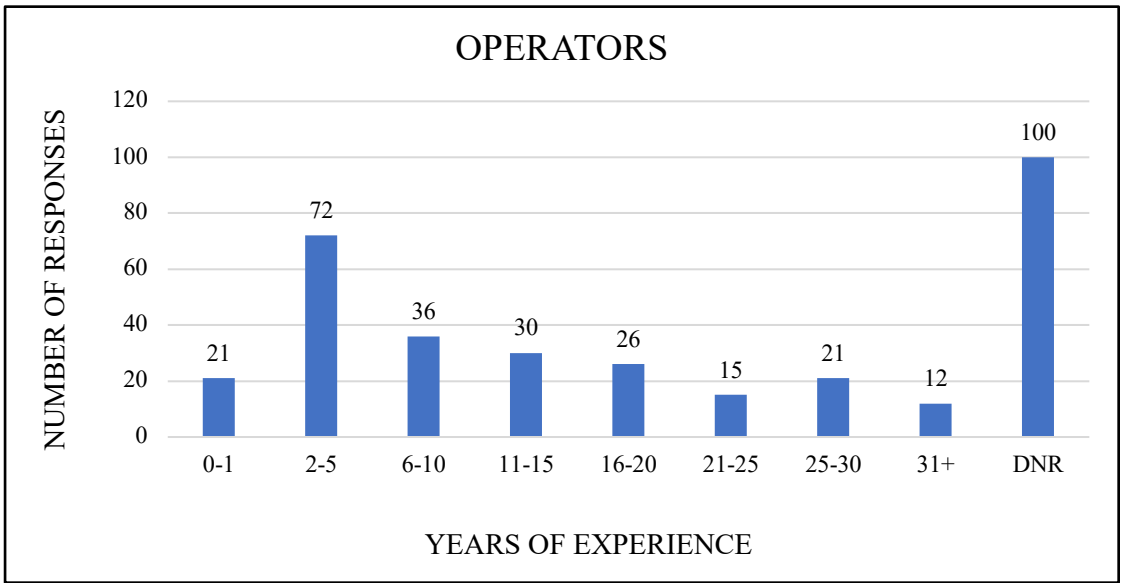


Figure 4.0.2



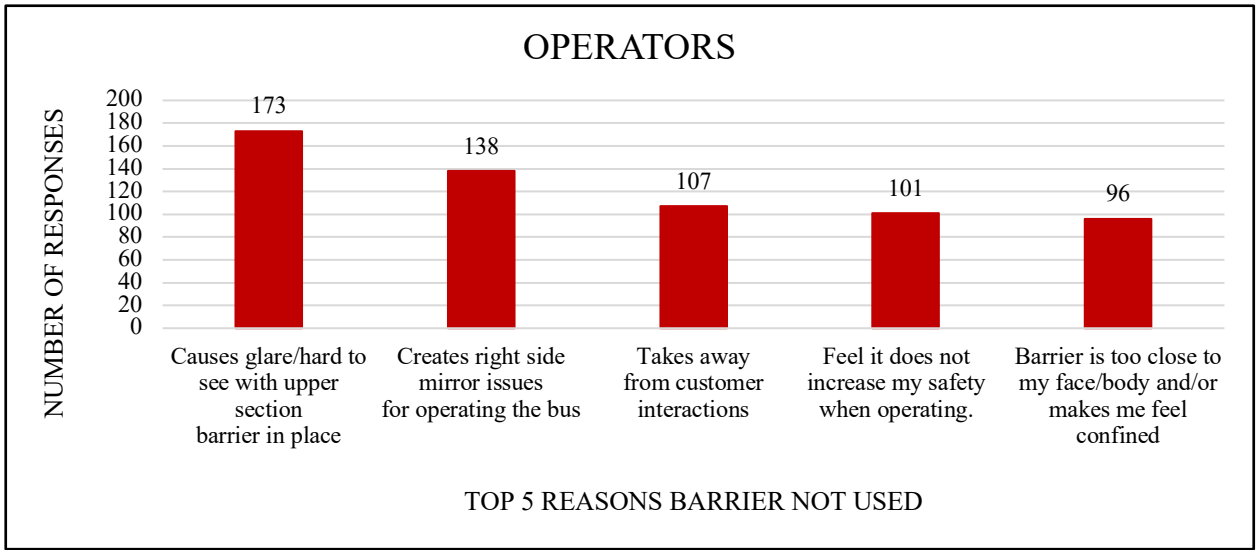
Bus operator use and operation of the safety barrier systems was next analyzed. Of the total 333 operators surveyed, 320 stated they had operated a bus with a safety barrier, 8 responded they had not, and 5 did not answer the question. Of those that responded, 307 bus operators stated they have used the barrier systems, while 21 operators stated they did not, and 5 operators did not answer the question. The survey showed that less than half (43%) of the operators responded that they used both portions of the safety barrier, 54% used only the bottom portion of the barrier, and 3% used only the top portion. However, OIG field observations of 229 operators found that only 18% of the operators used both portions of the barriers, 81% used only the bottom portion, and 1% used only the top portion.

There is a significant difference between 43% of operators responding on the survey that they used both portions of the barriers versus only 18% of operators being observed using both portions during field observations. This difference might be attributed to operators responding to the survey with what they perceived they were expected to do versus how they were actually observed using the barriers. It may also be that the survey results reflect that operators initially used the barriers, but over time discontinued their use as a result of operational and other issues. This is supported by the data presented in **Figure 4.0.3**, which presents the top five reasons why bus operators stated they do not use the barrier systems.

While other agencies were surveyed regarding the mandatory use of the barriers, only one of the agencies surveyed conducts audits of bus operator barrier use and this agency did not share the data from these audits. As a result, it is not possible to compare LA Metro to the other agencies surveyed to determine if the other agencies are achieving better or worse results, because there is no data from the other agencies to be used for comparison.

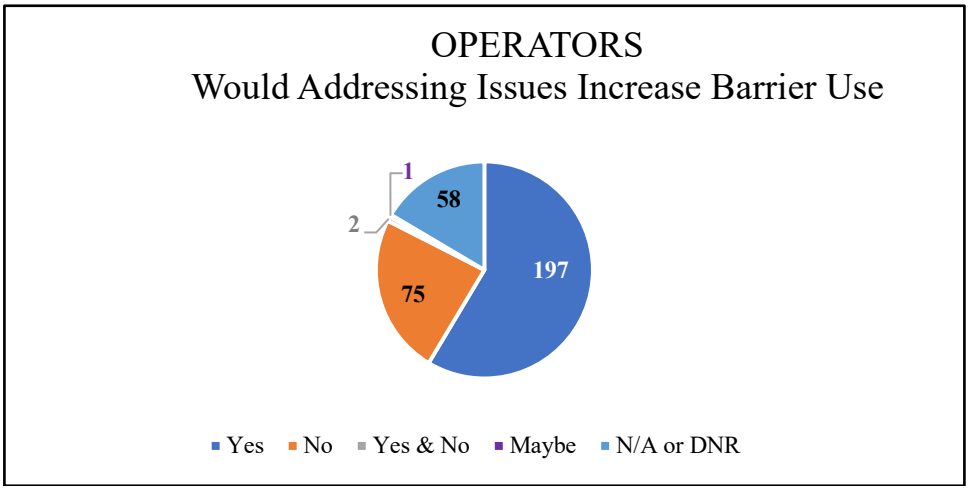
In addition, although the survey responses indicate a high number of operators are using the safety barriers, a significant number (251 or 75%) of responses received stated reasons why the barriers were **not** used. This indicates that while many bus operators have used the barrier systems, they are not used consistently.

Figure 4.0.3



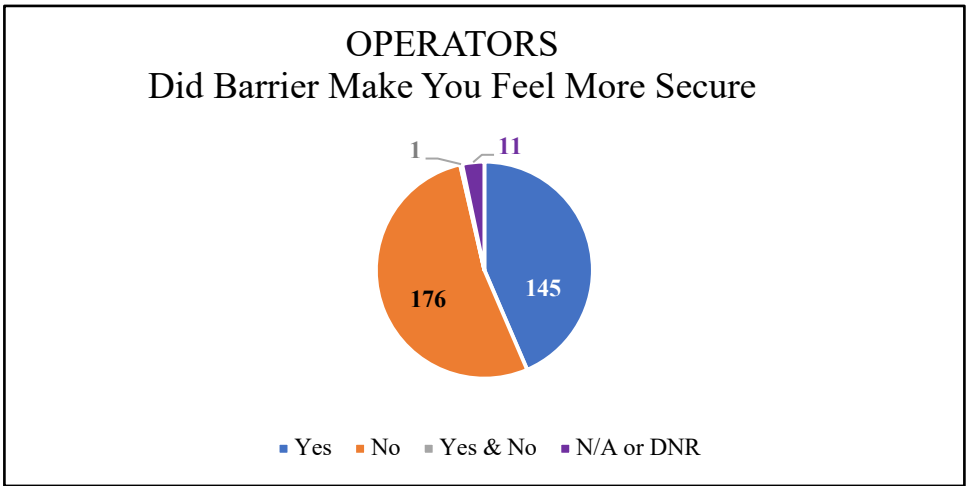
To investigate further as to why bus operators are not using the barriers, the survey asked if addressing the issues identified in **Figure 4.0.3** would increase the use of the barriers. As shown in **Figure 4.0.4**, the majority (59%) of respondents answered yes, agreeing that addressing these issues would increase their likelihood of using the barriers. However, a significantly large portion (i.e., 75 operators or 22.5%) said fixing the issues would not increase their use of the safety barriers.

Figure 4.0.4



The bus operator surveys also examined if the bus operators felt more secure using the safety barriers. As shown in **Figure 4.0.5**, 145 (43.5%) bus operators replied that they did feel more secure, while 176 (52.8%) replied that they ***did not*** feel more secure. One operator responded both yes and no (possibly an error in completing the survey), and 11 did not answer the question.

Figure 4.0.5



Bus operator survey data was also analyzed by age, gender and years of experience of the bus operators to determine if there were differences among males and females, among age groups, or among experience levels. The trend for both gender responses were similar. As shown in **Figures 4.0.6** and **4.0.7**, both male (54%) and female (56%) bus operators responded that they ***do not*** feel more secure with the barriers in place. Note that while a total of 322 operators provided a response to whether or not the barriers made them feel more secure, only 219 operators identified their gender in their survey responses. **Figure 4.0.8** compares the sense of security felt by differing age groups in using the safety barriers. Younger operators (i.e., 30 and under) were the only group that felt more secure using the barriers.

Figure 4.0.6

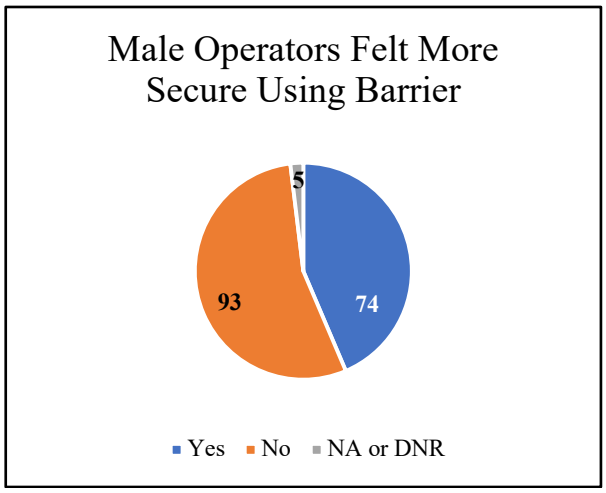


Figure 4.0.7

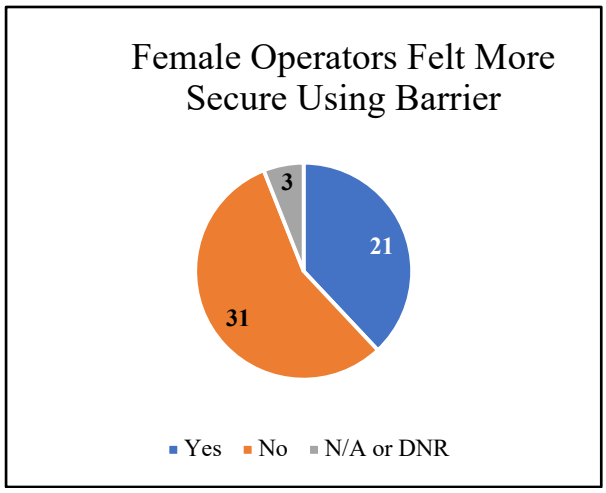
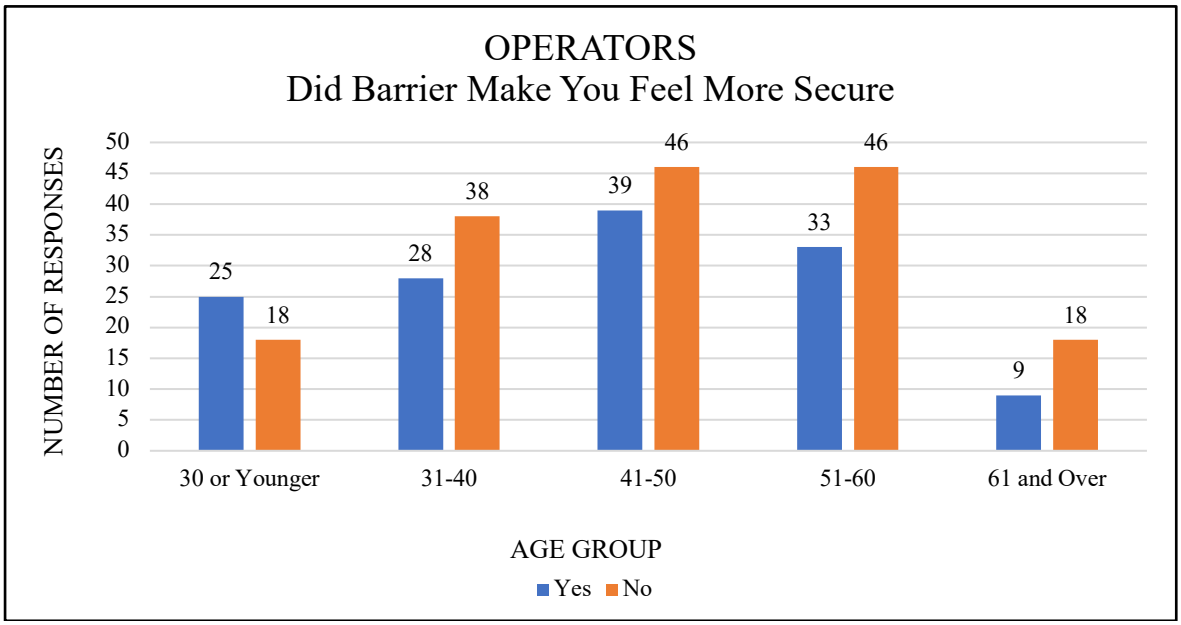


Figure 4.0.8



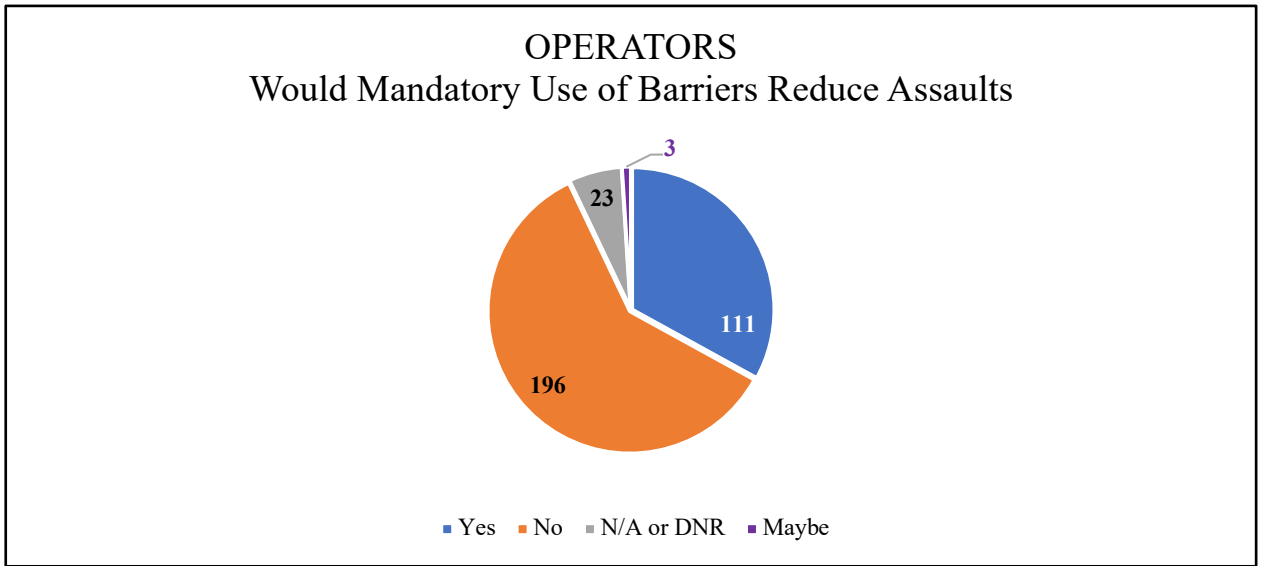
The bus operator survey also examined how effective bus operators thought the safety barriers are in preventing assaults. As shown in **Table 4.0.2**, approximately 72% of the respondents indicated that they felt the barriers were somewhat or very effective in preventing assaults. This is somewhat contradictory to previous results that indicated that the majority of bus operators do not feel more secure with the barriers in place.

Table 4.0.2

Response	Total Number Per Each Category
Did Not Respond	13
Very Ineffective	17
Ineffective	64
Somewhat Effective	168
Very Effective	71

Of the 333 bus operators surveyed, 13 did not to respond to the question of barrier effectiveness. This may be as a result of the bus operators fearing that responding to this question could lead to mandatory use of the barriers. Anticipating this concern, the survey asked whether the bus operators thought that mandatory use of the barriers would reduce assaults. As shown in **Figure 4.0.9**, 196 (59%) of the respondents felt that mandatory use of the barriers would not reduce the occurrence of assaults.

Figure 4.0.9



Again, the results of the analysis are somewhat contradictory in that the majority of bus operators answered that mandatory use of the barriers would not reduce assaults; however, as was shown in **Table 4.0.2**, the majority (72%) of bus operators also felt the barriers are somewhat or very effective in reducing assaults. This could be an indication that Metro's bus operators want the use of the barrier to remain optional.

This may also account for the large portion of bus operators that did not respond to the survey question of whether or not they felt the barriers were effective in preventing assaults. Also, the majority of the operators are not using both portions of the safety barriers.

Bus operator training with regard to the use of the barriers as well as de-escalation training for dealing the volatile situations was also examined as part of the bus operator survey. **Table 4.0.3** summarizes the results of this portion of the analysis. Of particular interest is the number of respondents who indicated they had not received either type of training. This may be because training is not mandatory for all staff, training is ongoing, or some bus operators had not yet received the training prior to completing this survey. Adding both training classes as part of the new hire training package, along with any other ongoing training requirements may help to fill this gap.

Table 4.0.3

Training Provided	Number that Received Barrier Use Training	Number that Received De-Escalation Training
Yes	101	170
No	213	118
Unknown or Did Not Respond	19	45

The survey also sought feedback as to the effectiveness of the training to determine if the training currently being provided to Metro's bus operators provides the necessary instruction needed to properly use the barriers and to safely address potentially volatile issues on the bus. As shown in **Table 4.0.4,** responses were inconclusive regarding the effectiveness of the training. The majority of the "Very Ineffective" responses for both training categories appear to be from operators who did not receive the training.

Table 4.0.4

Bus Operator Response	Barrier Training Effectiveness	De-Escalation Training Effectiveness
Very Effective	69	78
Somewhat Effective	67	95
Ineffective	38	31
Very Ineffective	32	27
N/A or Did Not Respond	127	102

5.0 Analysis of Metro Bus Supervisor/Bus Manager Survey Data

A survey of Metro Bus Supervisors and Bus Managers was developed and distributed to all 11 bus divisions to collect data concerning their usage and perceptions of the effectiveness of the safety barriers, as well as their overall assessment of the safety barriers and the associated training provided to bus operators. A total of 69 surveys were collected for analysis. **Appendix F** provides a copy of the Bus Supervisor / Manager Survey.

Again, not all of the surveys were completed in their entirety. However, sufficient responses were received to complete the analysis and identify potential trends. **Figure 5.0.1** shows the number of responses received from all 11 divisions while **Figure 5.0.2** illustrates the responses received by position title (DNR stands for "did not respond" to the question). A total of 69 surveys were collected - 45 Supervisors and 18 Managers responded, but 6 did not respond to this survey question.

Figure 5.0.1

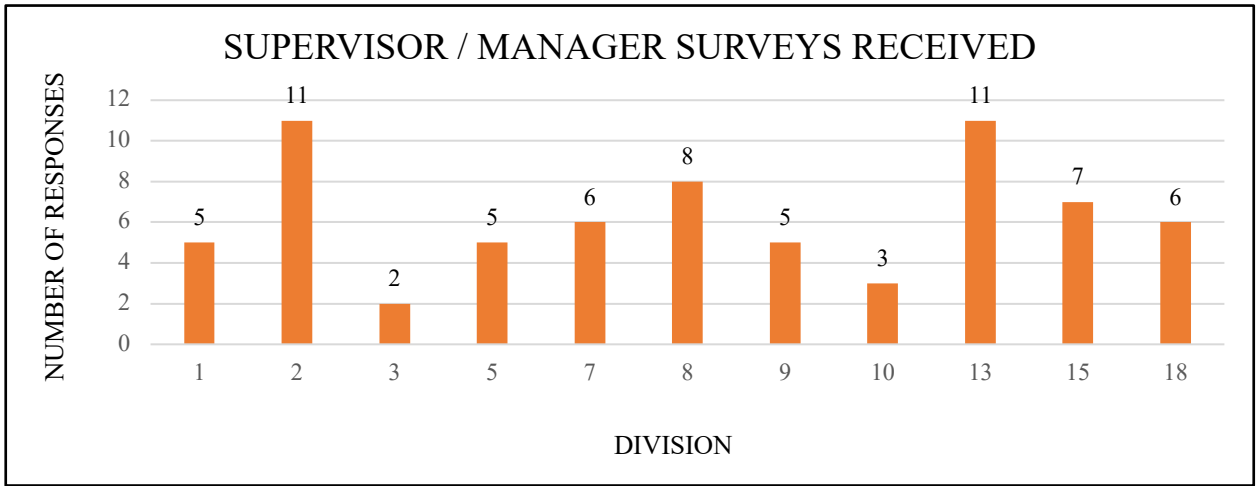
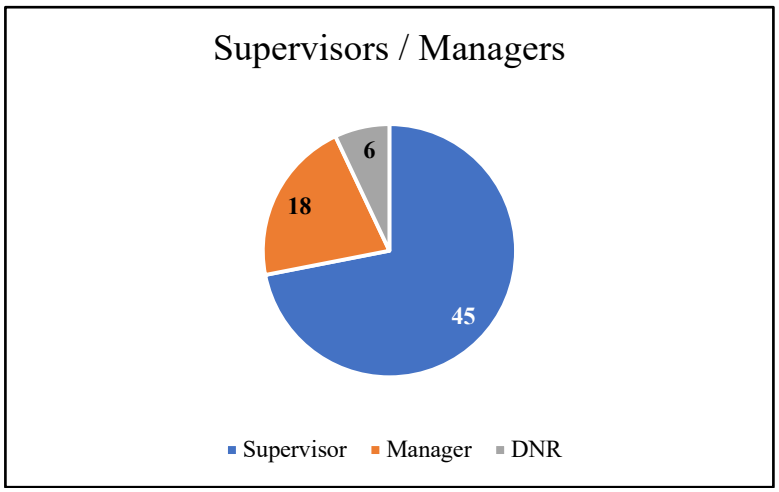


Figure 5.0.2



Understanding that not all Supervisors and Managers had driven a bus with the barriers in place, the survey focused on capturing Supervisor and Manager perceptions of the effectiveness of the barriers. **Figure 5.0.3** provides a breakdown of Supervisors and Managers who had (33%) or had not (65%) operated a bus with a safety barrier at the time of the survey.

Figure 5.0.3

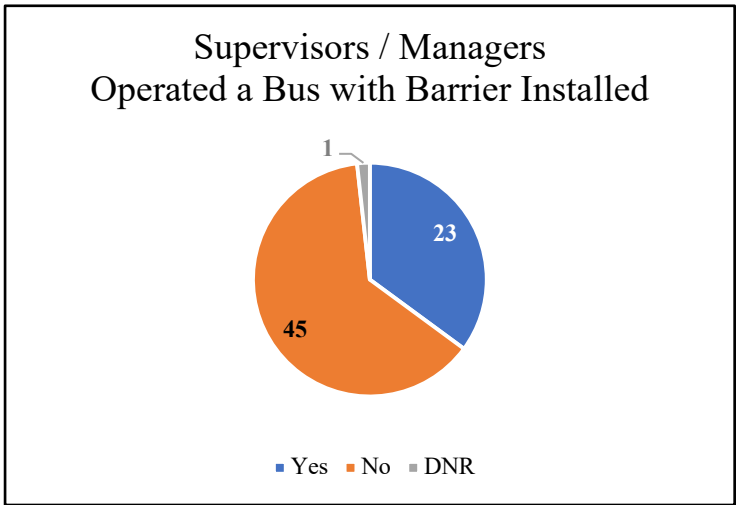


Figure 5.0.4 illustrates the number of Supervisors and Managers that have operated a bus equipped with a safety barrier system. Of the Supervisors and Managers that had driven a bus with a safety barrier, the number that had used (20) or not used (22) the barrier was approximately equal. The 24 Not Applicable (N/A) responses were attributed to respondents that had not operated a bus with a barrier, and 3 individuals did not respond (DNR) to the question.

Figure 5.0.4

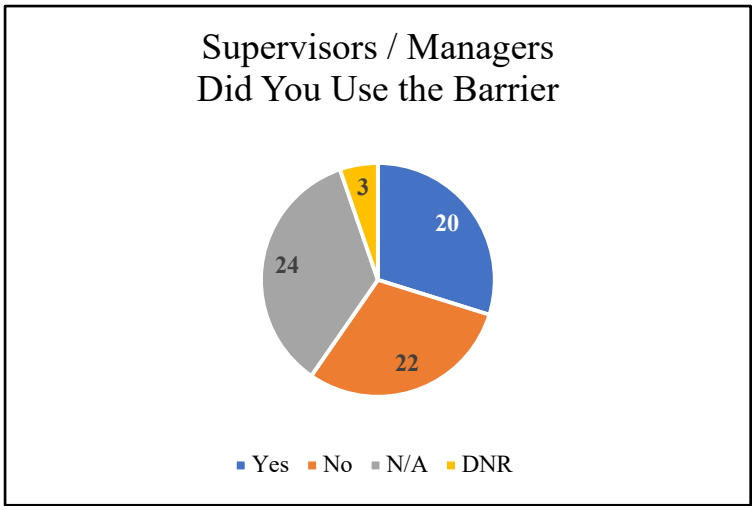


Figure 5.0.5

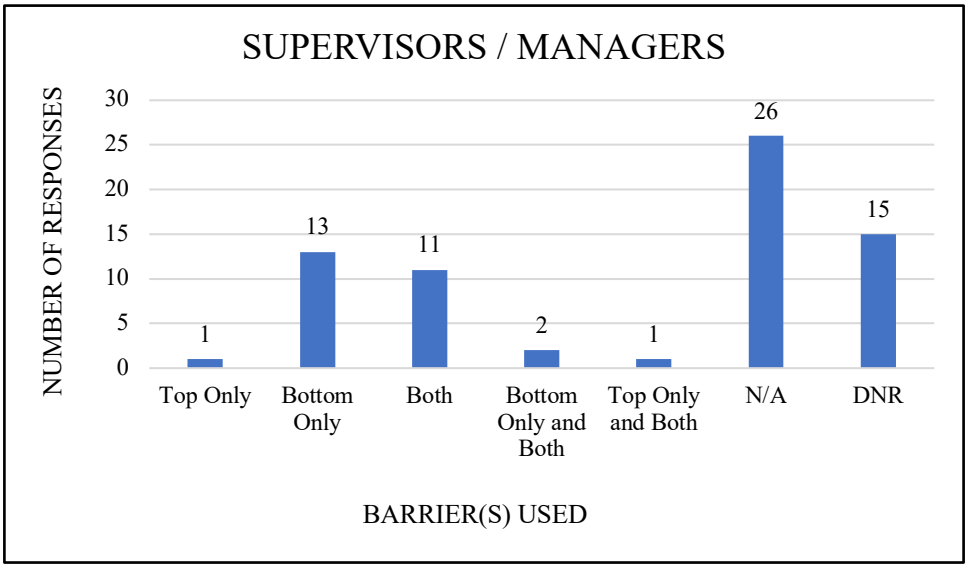
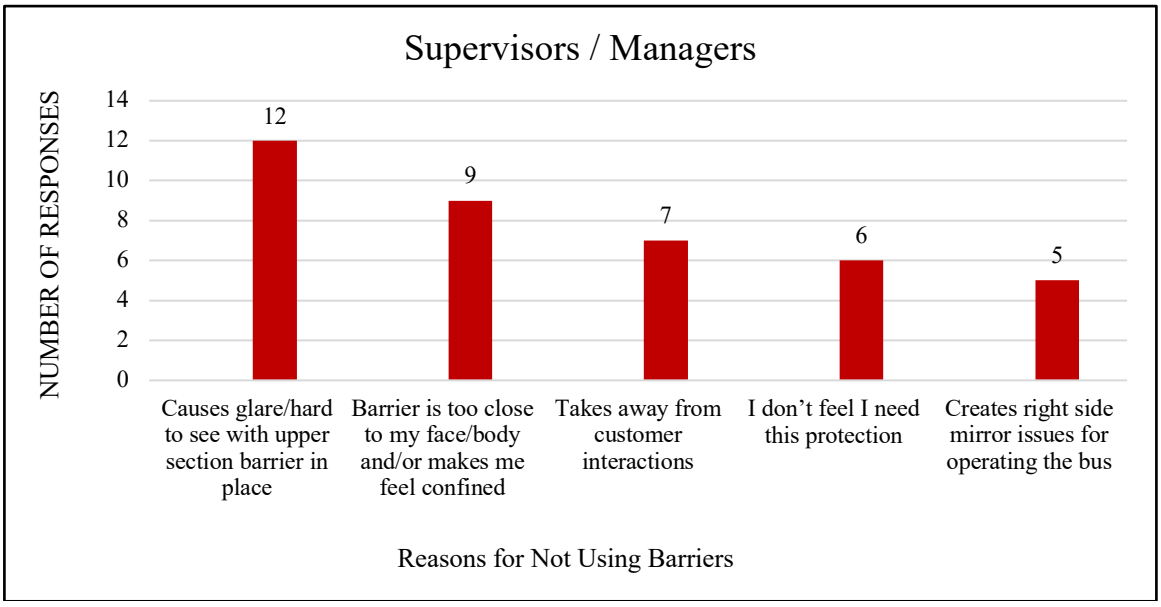


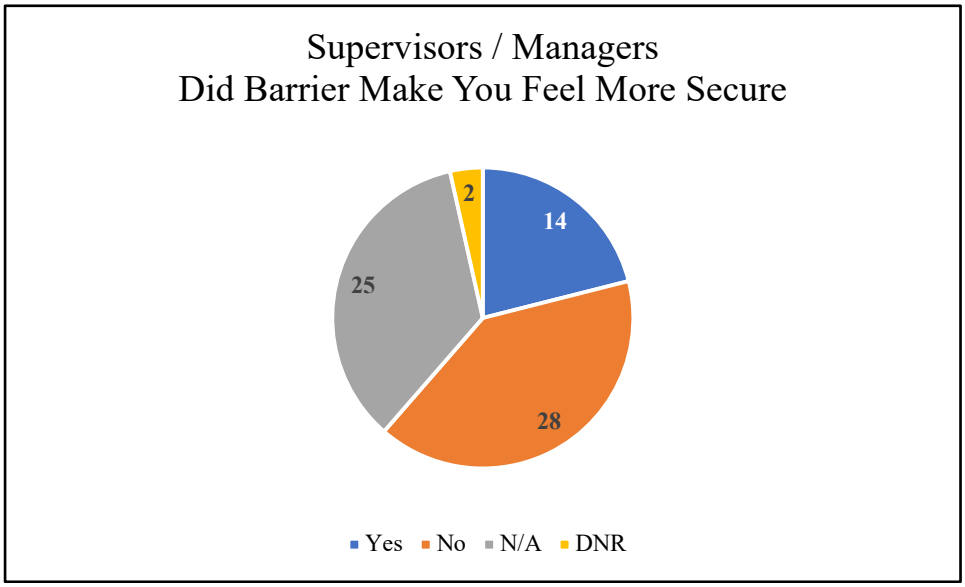
Figure 5.0.5 shows the number of Supervisors and Managers who have used the barriers in differing and/or multiple configurations (i.e., top only, bottom only, both bottom and top). **Figure 5.0.6** identifies the reasons Supervisors and Managers did not use the barriers, which were mostly similar to those cited by operators (**Figure 4.0.3**).

Figure 5.0.6



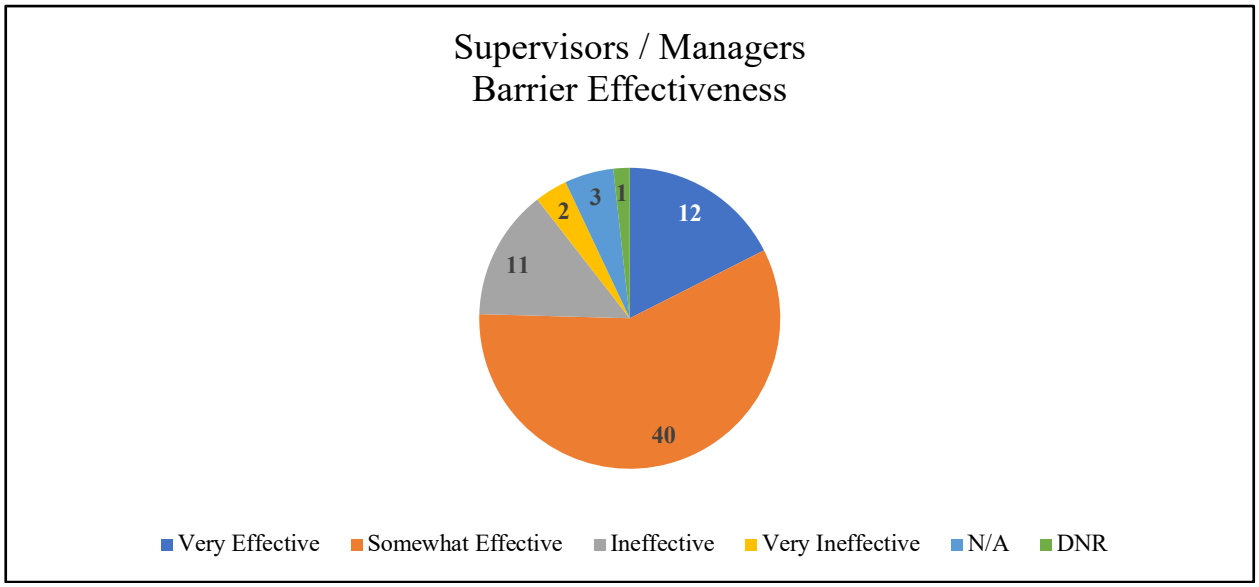
Bus Supervisor and Manager perceptions with regard to whether the barriers provided an increased sense of security was also studied. Responses, summarized in **Figure 5.0.7**, were consistent with those of Bus Operators in that 41% responded that the barriers did not make the Supervisor or Manager feel any more secure.

Figure 5.0.7



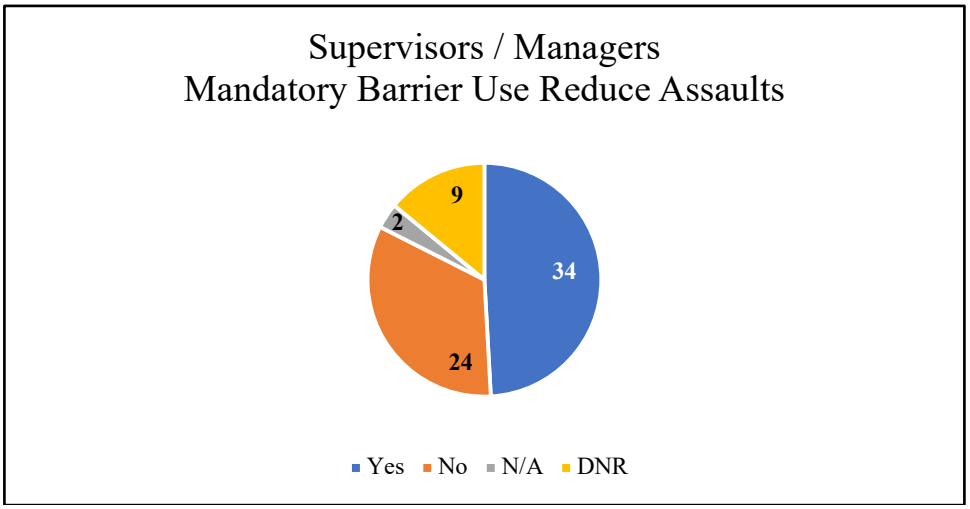
As shown in **Figure 5.0.8**, 52 (75%) of the Supervisor and Manager respondents felt that the barriers were very effective or somewhat effective in providing protection to bus operators.

Figure 5.0.8



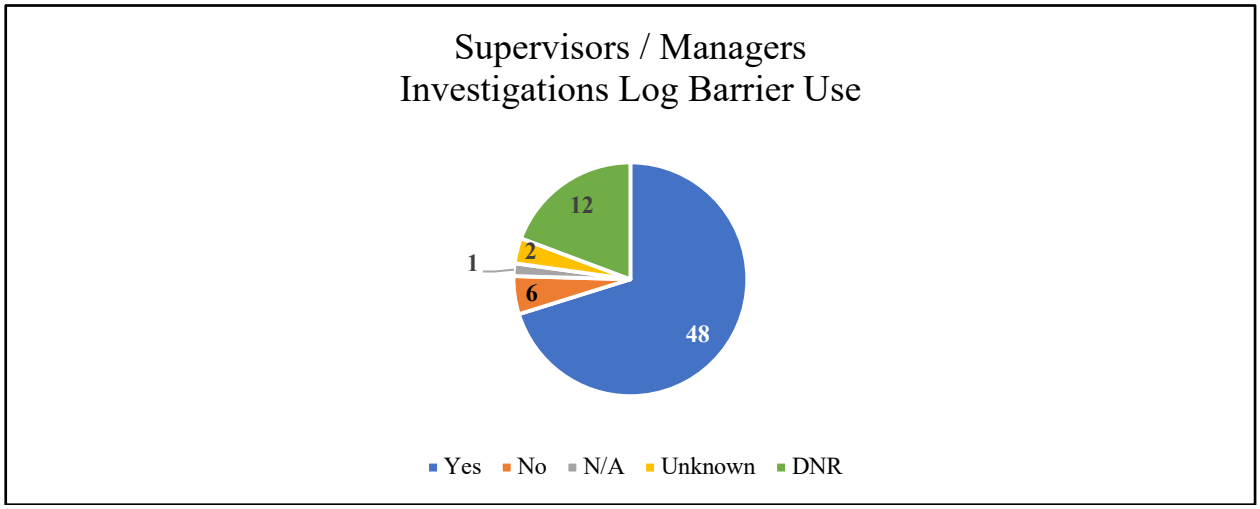
In addition, as shown in **Figure 5.0.9**, approximately 50% of Supervisors and Managers believed mandatory use of the barriers would be beneficial.

Figure 5.0.9



Finally, Supervisors and Managers were asked a series of questions regarding the types of data collected during operator assault investigations. In analyzing this data, it was noted that not all investigation reports identify whether or not a barrier was installed on the bus and/or what section of the barrier, if any, was being used at the time of the assault. However, 48 (70%) of the Supervisors and Manager responses indicate this data is collected. This may be the result of increased efforts in the recent years, with the installation of barriers, to collect this data as part of the investigation process. **Figure 5.0.10** illustrates the Supervisor and Manager responses regarding documentation of barrier use during an investigation.

Figure 5.0.10



6.0 Analysis of Industry Survey Data

As part of the study objectives, an industry survey was completed to compare transit agencies similar to Metro in regard to their use of and experience with bus operator safety barriers. The survey, included in **Appendix G**, was sent to 13 transit agencies within the United States, England, and France. Six agencies responded with usable data. Respondents to the survey included:

- Miami-Dade Transit (MDT)
- Washington Metropolitan Area Transit Authority (WMATA)
- Maryland Transit Administration (MD MTA)
- New York City Transit Authority (NYCTA)
- Massachusetts Bay Transportation Authority (MBTA)
- Tri-County Metropolitan Transit District of Oregon (TriMet)

Properties that were contacted but did not respond, or that responded with data that was not useable included:

- Dallas Area Rapid Transit (DART)
- Chicago Transit Authority (CTA)
- San Francisco Municipal Transit Authority (SFMTA)
- Keolis Transit America Las Vegas
- Transportation for London (TFL)
- RATP, Paris
- Regional Transportation District (RTD) of Denver, CO responded; however, RTD does not have safety barriers on their buses.

Table 6.0.1 provides a comparison between Metro and each of the six transit properties that responded with usable data. The responding agencies were of similar size and ridership as Metro, which allowed for a complementary level of data comparison.

Table 6.0.1

Agency	Number of Buses	Number of Operators	Annual Ridership	Type(s) of Barrier(s)	Percent of Buses With Barriers Installed
LA Metro	2,357	3,800	275,777,661	Arow Global	≈ 50%
WMATA	1,507	2,500	123,000,000	Arow Global	76%
NYCTA	5,778	12,300	720,000,000	Bentech TCB/NF Arow Global Nova Bus	82%
MDT	800	1,764	51,759,916	Integrated into bus specifications and installed by manufacturer for all new buses delivered since 2003	100%
TriMet	670	1,397	56,737,466	ArowGuard Fixed System with extended glass	6%
MBTA	1,023	1,650	116,038,720	Arow Global	39%
MD MTA	760	1,345	63,746,000	New Flyer (OEM)	100%

The industry survey focused on the same areas studied through the Bus Operator and Bus Supervisor and Manager Surveys. In this manner, a comparison could be made between Metro and the responding transit properties with regard to the use of the bus operator safety barriers, the types of assaults typically experienced, barrier effectiveness, tracking the usage of barriers, and recording barrier usage during assault investigations. The industry survey also asked if the transit property was willing to share detailed statistical data with Metro in the future in the event further analysis and benchmarking was pursued. In addition, the survey collected data regarding the training provided to employees regarding the use of the safety barriers, as well as de-escalation training for volatile situations.

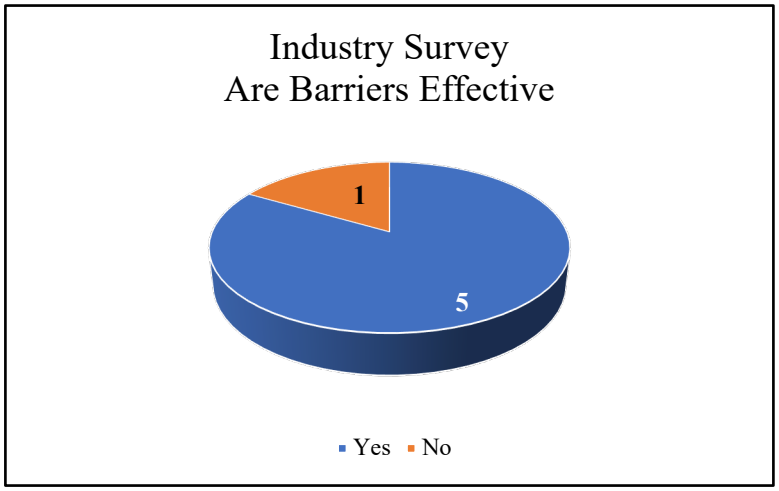
Table 6.0.2 summarized the industry survey results. An individual breakdown for all the questions asked on the survey is contained in **Appendix D**.

Table 6.0.2

Category	Yes	No	N/A
Buses equipped with other security measures	5	1	0
Barriers difficult to install/maintain	1	5	0
Gathered feedback from Bus Operators on barriers	4	2	0
Barrier training provided to Bus Operators	3	3	0
Barrier training deemed effective	3	0	3
De-escalation training provided to Bus Operators	6	0	0
De-escalation training deemed effective	6	0	0
Investigation of barrier use after an assault	5	1	0
Training provided to prevent future assault to Bus Operators	5	1	0
Willing to share data	5	1	0

Since three of the six agencies surveyed did not provide safety barrier training for their operators, their response to the effectiveness of the training was "N/A", not applicable. **Figure 6.0.1** shows that five of the six agencies surveyed are using the same or similar safety barriers (Table 6.0.1, column 5) and believe these systems to be effective in preventing or deterring operator assaults.

Figure 6.0.1



As depicted in **Figures 6.0.2,** of the six agencies that responded to the industry survey, three believed the barriers had been positively received by their bus operators, two had not gathered feedback (N/A), and one had received negative feedback. **Figure 6.0.3** depicts that two agencies also believed that the barriers provided the level of protection desired, and one agency's answer of "Yes and No" would indicate they potentially would like to see additional improvements in the barrier. In addition, five of the six responding transit properties require the use of the barriers, which may have led to three agencies answering "N/A", while only one allowed for optional use at the discretion of the bus operators. No agency believed the barriers did not provide desired protection.

Figure 6.0.2

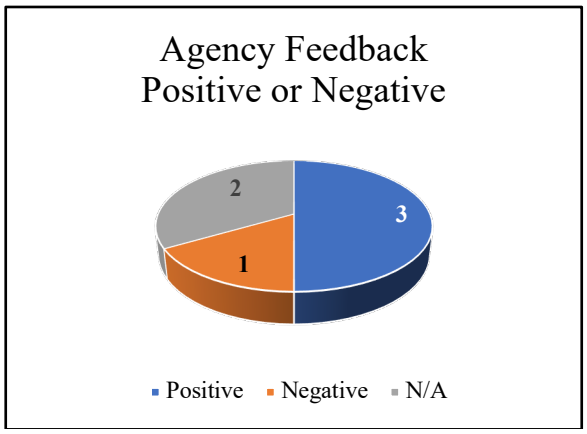
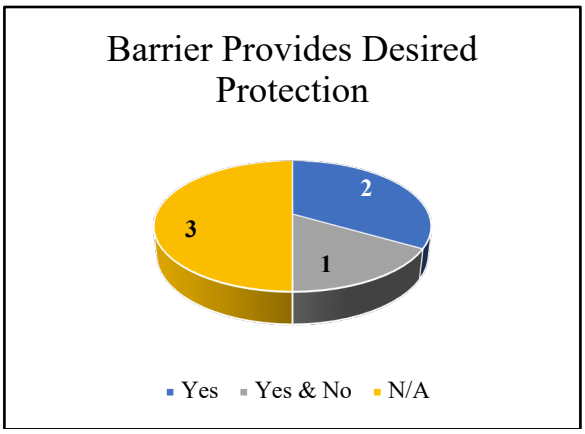
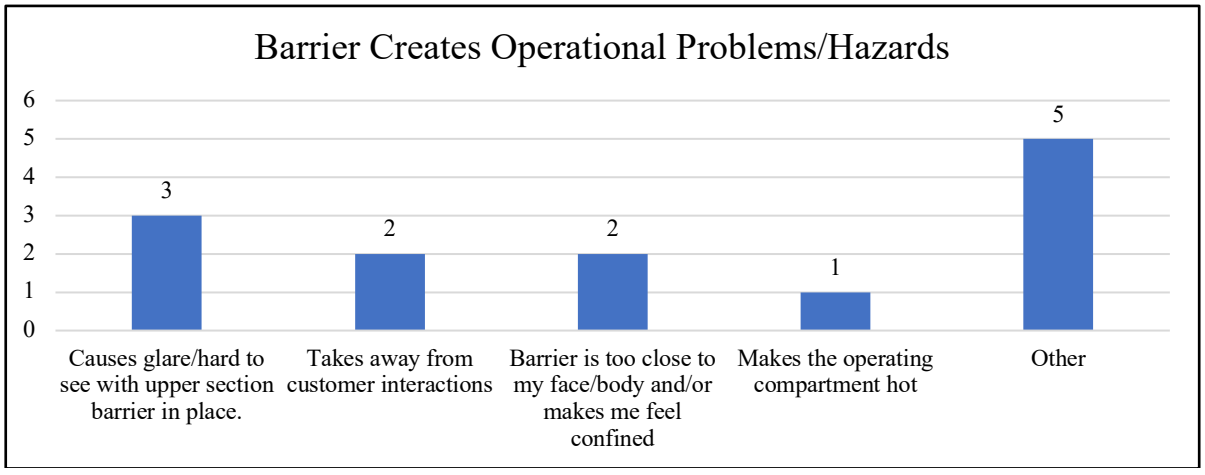


Figure 6.0.3



The survey sought to identify issues that bus operators encounter while using the barriers. **Figure 6.0.4** identifies the top issues cited by the bus operators of other transit properties. The "Other" category included responses such as "I don't feel I need the protection," "Feel it does not increase safety," and "Barrier creaks or makes noise when used." As with the Metro bus operator surveys, glare was one of the top issues identified.

Figure 6.0.4



7.0 Findings and Recommendations

The following findings and recommendations have been developed based on the results of the data analysis, survey results, and industry research.

Finding 1: Safety barriers and onboard camera systems appear to be effective deterrents to assaults on bus operators.

The frequency of assaults on bus operators increased from 107 to 153 between 2010 and 2015. The bus operator safety barriers began to be installed in 2015, and onboard cameras and monitors began to be installed on buses beginning in 2016. Assault frequency began to decrease between 2016 through 2018 to 80 assaults in 2018. Based on these results, the presence of the safety barriers, on board camera and monitor systems, and possibly improved deployments of security personnel appear to be effective in reducing the frequency of assaults occurring against Metro's bus operators.

Recommendation 1 – Continue Installation Program

a. Metro should continue to install the bus operator safety barriers and onboard camera and monitor systems throughout its bus fleet and continue to monitor incident data to further verify the effectiveness of both systems in preventing assaults on bus operators.

Finding 2: Data pertaining to the bus operator use of safety barriers during assaults is inconsistently collected by stakeholders.

Data regarding bus operator assaults has not been consistently collected and recorded by Metro, the Los Angeles County Sheriff's Department, and the Los Angeles Police Department. This includes bus operator assault investigation reports which do not always note whether the bus was equipped with a safety barrier or what, if any portion (e.g., the top portion, bottom portion, or both) of the barrier was in use at the time of the assault.

Recommendation 2 – Standardize and Enhance Data Collection

a. Metro should ensure data collection is standardized by Metro and all transit security providers and investigators to consistently identify the types of assaults that have occurred, if the bus was equipped with a safety barrier, if the barrier was in use at the time of the assault, and if in use, how it was being used (i.e., top portion only, bottom portion only, or both portions). Standardizing the data in this manner will result in more accurate and consistent data that can be more easily analyzed to identify trends and to measure performance.

b. Metro should ensure data is collected on the type and extent of injuries incurred by bus operators when the safety barriers are in use. This will further aid in determining the effectiveness of the safety barriers (i.e., if bus operator injuries are lessened as a result of the barriers being used) and if design changes or modifications are necessary.

Finding 3: Assaults occur more frequently on bus routes 4, 204, 720, 207, and 40 than others, during the afternoon hours of 1:00 pm to 5:00 pm, and most predominantly as a result of fare disputes.

Bus routes 4, 204, 720, 207, and 40 were identified as the top five routes having the most frequent occurrences of assaults on bus operators. Assaults on bus operators occur most frequently between 13:00 and 17:00 hours (i.e., 1:00 pm to 5:00 pm). Fare disputes are the most frequent cause of assaults on bus operators.

Recommendation 3 – Utilize Data Analysis to Set Policing Strategy

a. Metro should ensure that assault trend analysis results are used to review current policing and fare enforcement strategies to determine if law enforcement, Supervisors, and fare enforcement personnel and strategies are being appropriately deployed toward the routes and times of day in most need of Police, Supervisory, or fare enforcement presence.

Finding 4: Metro's bus operators do not consistently use the safety barriers.

A total of 48 assaults against bus operators occurred between 2015 (when the barriers began to be installed) and 2018. Of these incidents, only 12 occurred while both the top and the bottom sections of the safety barriers were in place; 7 occurred while only the bottom portion of the barrier was in place; and 29 occurred while no part of the barrier was in use during the assault.

Of the 333 bus operators surveyed, 320 stated they had operated a bus equipped with a safety barrier; 8 responded they had not; and 5 did not answer the question. Also, 307 bus operators stated they had used the barrier systems, while 21 operators stated they have not.

OIG field observations revealed low usage of the barriers by Metro's bus operators. In addition, 54% of the bus operators surveyed indicated they only use the bottom portion of the safety barrier if they decide to use it at all.

Nearly all bus operators surveyed provided reasons why they do not use the barriers. These reasons, listed in order of precedence, included the barriers causing glare, the barriers causing right-side mirror issues, the barriers taking away from customer interactions, operators believing that the barriers do not increase their safety, and the barriers being confining.

The majority of bus operators surveyed (59%) stated that mandatory use of the barriers would not reduce assaults; however, the majority (72%) also felt the barriers are at least somewhat or very effective in reducing assaults. This could be an indication that Metro's bus operators want the use of the barriers to remain optional.

Approximately 50% of all bus Supervisors and Managers surveyed believed mandatory use of the barriers would be beneficial in preventing assaults on bus operators. In addition, five of six transit agencies surveyed require the mandatory use of safety barriers, while only one agency allowed for optional use.

Recommendation 4 – Issue Mandatory Usage Policy

a. Metro should make the use of the barriers mandatory until Metro can determine if their use contributes to or causes accidents or increases accident frequency. Mandatory use of the barriers is the best way to evaluate their true effectiveness in reducing assaults on bus operators.

b. If the use of the barriers is made mandatory, Metro should collect data to substantiate and study the issues identified by operators as to why they do not use the barriers. Metro can then take corrective action, such as design changes and modifications to the barriers, if accident/incident data substantiate operator concerns.

Finding 5: Although most of Metro's bus Operators and bus Supervisors and Managers believe the safety barriers are effective in preventing assaults, nearly half believe other additional protective measures are needed.

Approximately 72% of the bus operators and 75% of bus Supervisors and Managers surveyed felt the barriers were somewhat to very effective in preventing assaults. However, 53% of all bus operators surveyed and 62% of all bus Supervisors and Managers surveyed stated that additional protective measures were needed in addition to the safety barriers. A number of bus operators noted that the current safety barriers have gaps that they felt left them vulnerable to assaults. These gaps can be seen in **Figures 7.0.1 and 7.0.2**.

Figure 7.0.1

Figure 7.0.2

Similarly, 56% of male bus operators and 60% of female bus operators stated that they ***did not*** feel more secure as a result of the safety barriers. Likewise, 41% of bus Supervisors and Managers surveyed responded that the barriers did not make them feel any more secure. These responses might indicate that the transparency of the barriers actually detracts from the feeling of safety or some other aspect of the barrier is undermining the feeling of safety.

Of all the bus operator age groups studied, only those bus operators 30 years of age or younger responded that they felt more secure using the barriers.

Recommendation 5 – Establish Communication Channels for Follow-Up and Discussion of Bus Barrier Issues

a. Metro should further study why bus operators feel the bus safety barriers do not provide the protection needed to make them feel more secure and the other measures bus operators would like to see implemented.

b. Evaluate the current design of the safety barriers to determine if bus operators' concerns can be addressed through design changes and modifications made to the safety barriers.

c. Create a committee comprised of bus operators, Supervisors and Managers, Safety Department, and Bus Operations and Bus Maintenance personnel to investigate these issues and to determine appropriate mitigations. The focus of the committee should include an effort to increase barrier use, identify ways to make the barriers more effective, and evaluate training, and improve data collection and accuracy. Metro could also consider utilizing an existing committee to take on this action, if one has already been established for investigating possible safety issues with systems and equipment.

Finding 6: Metro's training programs pertaining to the use of safety barriers and de-escalation training could be improved.

Only 41% of bus operators surveyed felt Metro's training program for use of the safety barriers was somewhat to very effective, while 52% of bus operators surveyed felt that Metro's de-escalation training was somewhat to very ineffective.

Recommendation 6 – Expand Scope of Training

a. Metro should review safety barrier and de-escalation training to evaluate scope of attendees, frequency, content, method of delivery, consistency of delivery, and employee engagement and understanding. Results from these evaluations should be used to modify training programs as necessary.

b. Consider adding both training classes as part of the new hire training course and periodic refresher training for current operators along with any other ongoing training requirements.

Finding 7: Metro's experiences with assaults on its bus operators and the actions it is taking to prevent these types of incidents is consistent with other transit properties.

The issue of Transit Operator assaults continues to be a leading concern for the transit industry. In response, the Transportation Research Board (TRB), through the Transit Cooperative Research Program (TCRP), has conducted two projects to provide the transit industry with guidance on how to combat the problem of operator assaults. These included:

- TCRP Research Report 193: Tools and Strategies for Eliminating Assaults Against Transit Operators; and
- TCRP Synthesis 93: Practices to Protect Bus Operators from Passenger Assault.

These reports examine the use of safety barriers to prevent bus operator assaults and present other strategies for preventing such assaults. The reports also explore the contributing factors of assaults and how they can be mitigated and provide an in-depth risk-based calculator that can be used to predict where future assaults may occur, so proactive steps can be taken to prevent their occurrence.

TCRP Research Report 193 determined fare disputes accounted for 44% of all assault causes. In comparison, of the total assaults reported by Metro between 2015 and 2018, 48% were attributed to fare related disputes. Other causes of assaults identified by TCRP Report 193 were again similar to those identified by Metro and included rule/policy violations, and service issues (i.e., missed stop or demanded stop).

In addition, analysis of industry survey results indicates that Metro is taking many of the same steps as other transit properties to prevent bus operator assaults. The installation of barriers, use of closed-circuit television, training on de-escalation techniques, and targeted policing missions are all industry best practices; many of which Metro is performing.

Of the transit properties that responded to LA Metro's survey, six have undertaken programs to install bus operator safety barriers. However, unlike Metro, five of the six responding transit properties require mandatory use of the barriers, while only 1 allows for optional use at the bus operators' discretion.

The issues identified by Metro's bus operators regarding the safety barriers are also similar to those experienced by other transit properties. Each of the transit properties that responded to LA Metro's survey identified issues of glare, confinement, and taking away from customer interactions as being leading operator complaints regarding the barriers.

Each of the six responding transit properties provides de-escalation training to their bus operators, and three of the six provide training on how to properly use the barriers.

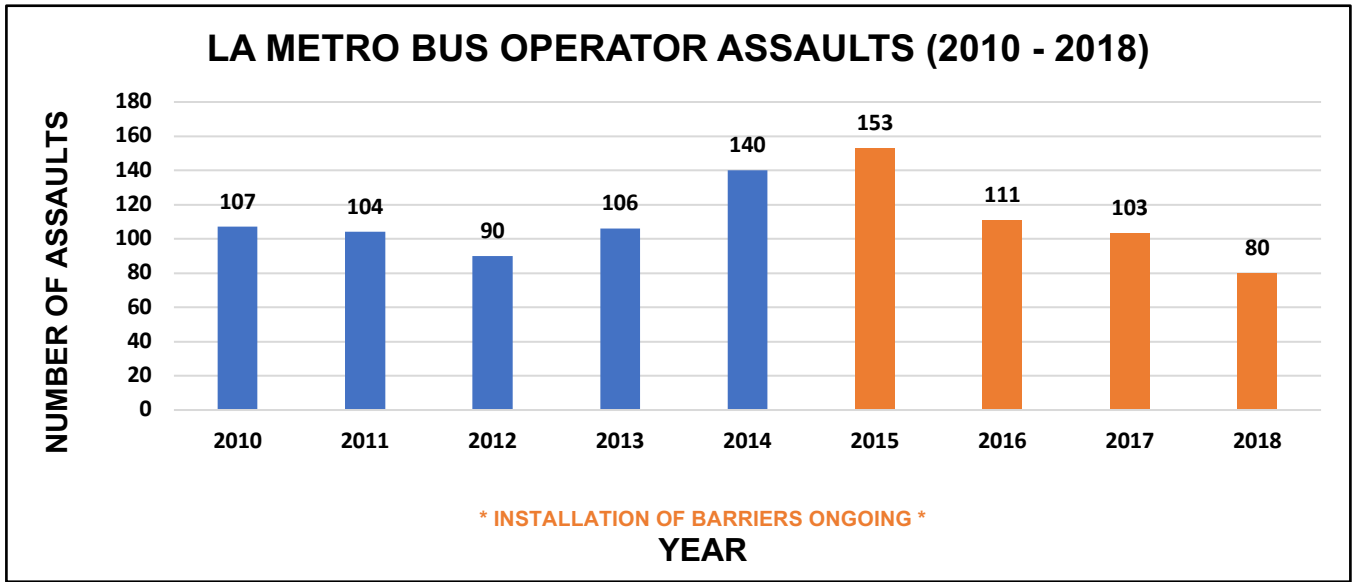
Recommendation 7 – Continue Strengthening Preventative Measures to Combat Operator Assaults

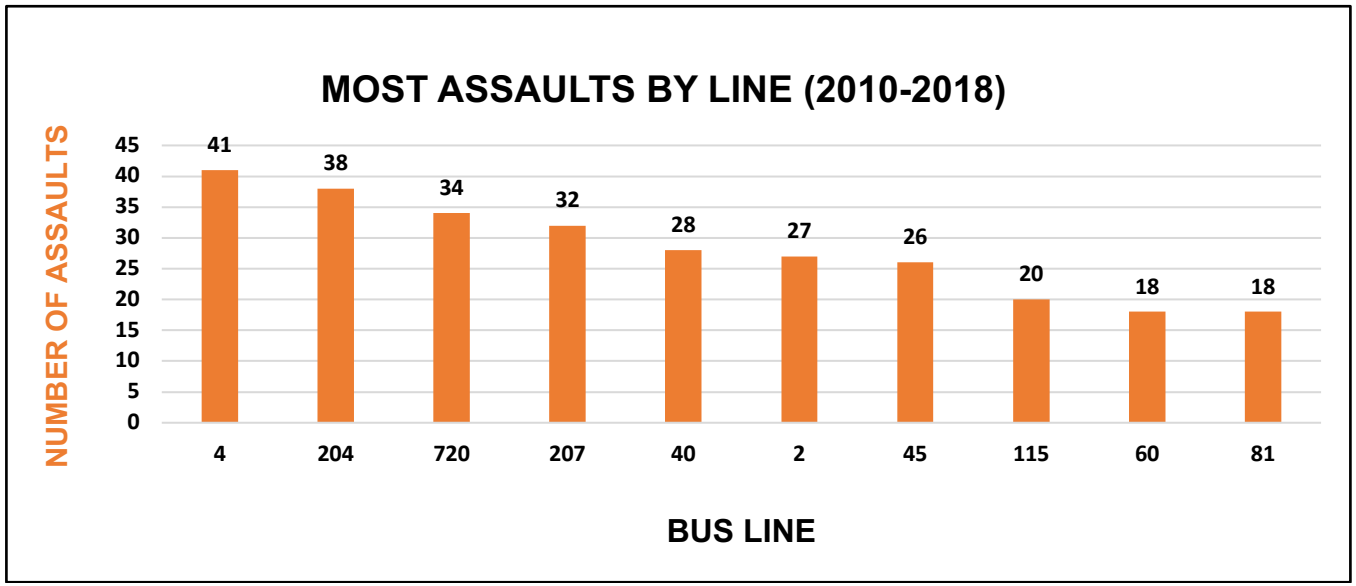
a. Metro should continue to follow its current strategies and implement its current programs to prevent assaults on bus operators. These programs are consistent with industry best practices.

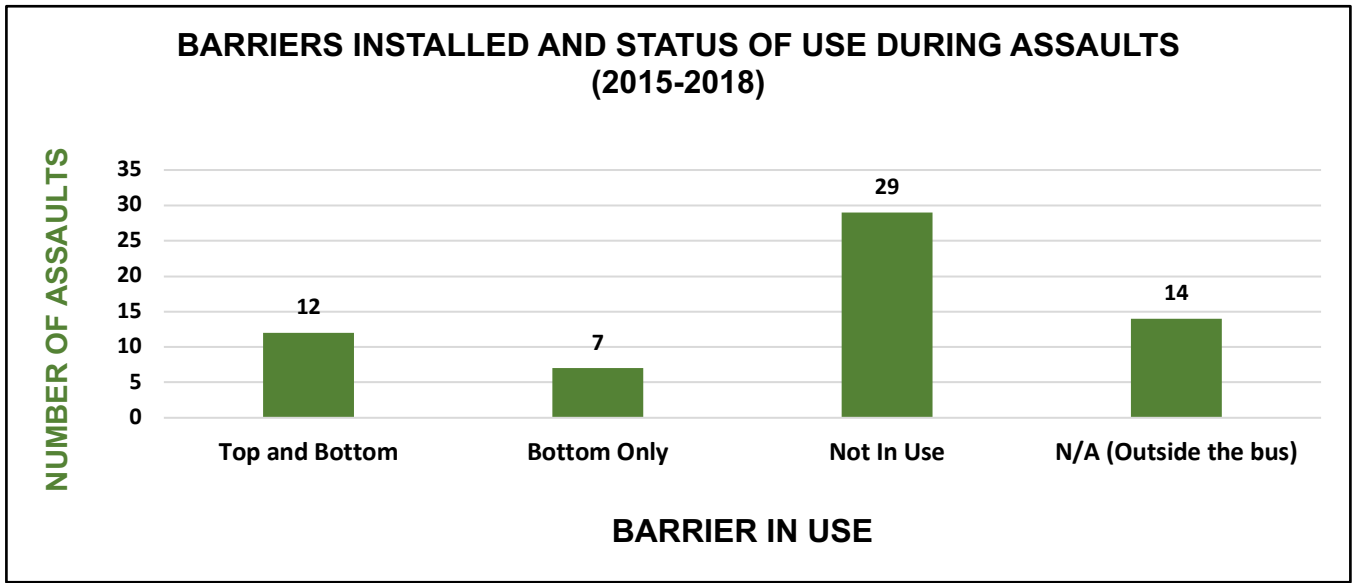
b. Consider using some of the evaluation tools developed by TCRP to identify in more detail where its greatest risks reside and employ tactics such as targeted fare enforcement and policing patrols to address problem areas using existing resources.

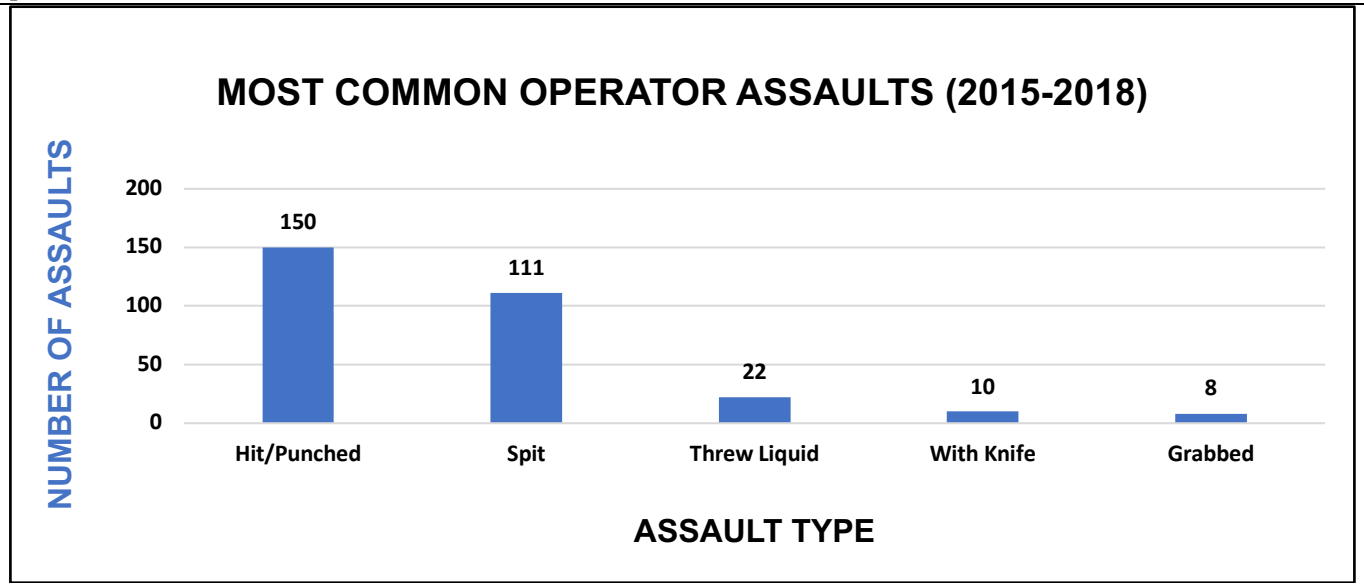
APPENDIX A – Historical Data Analysis Charts and Graphs

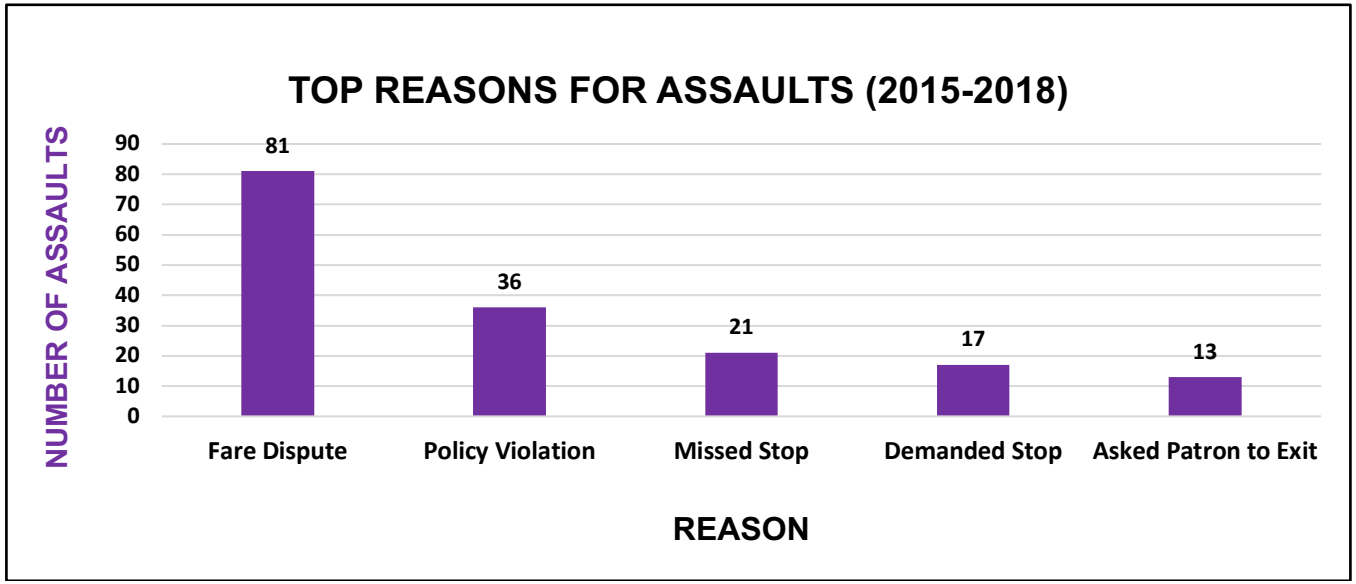
This Appendix contains the graphs and charts that were produced from analyzing the historical and assault data provided by the OIG.

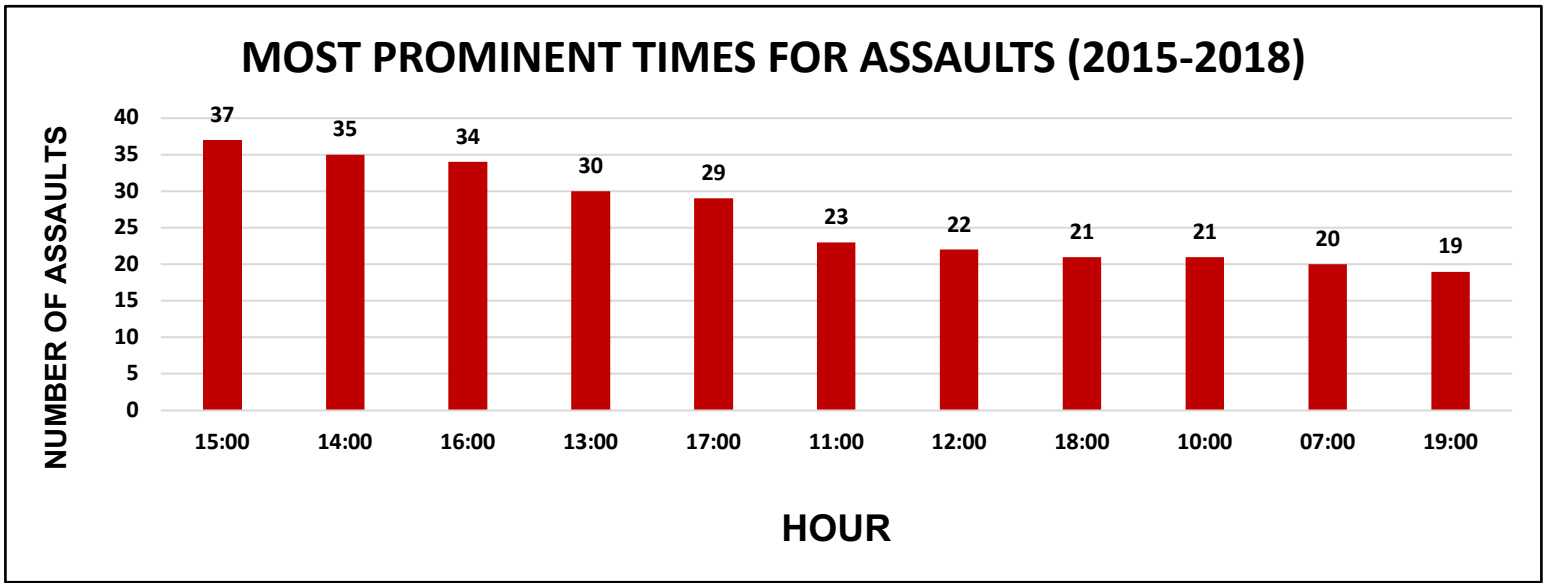


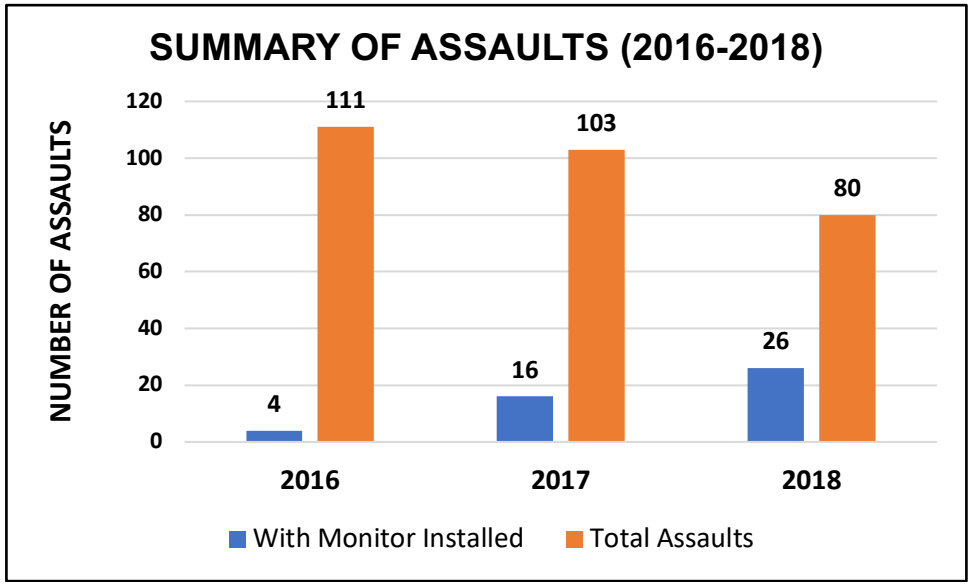

MOST ASSAULTS BY LINE (2010-2018)
NUMBER OF ASSAULTS
45
40
35
30
25
20
15
10
5
0
41
38
34
32
28
27
26
20
18
18
4
204
720
207
40
2
45
115
60
81
BUS LINE

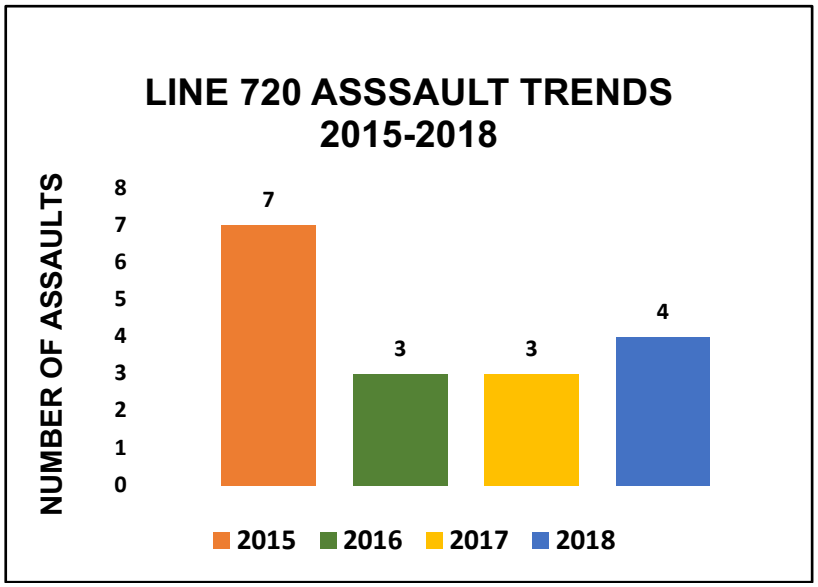

BARRIERS INSTALLED AND STATUS OF USE DURING ASSAULTS (2015-2018)
NUMBER OF ASSAULTS
35
30
25
20
15
10
5
0
12
7
29
14
Top and Bottom
Bottom Only
Not In Use
N/A (Outside the bus)
BARRIER IN USE

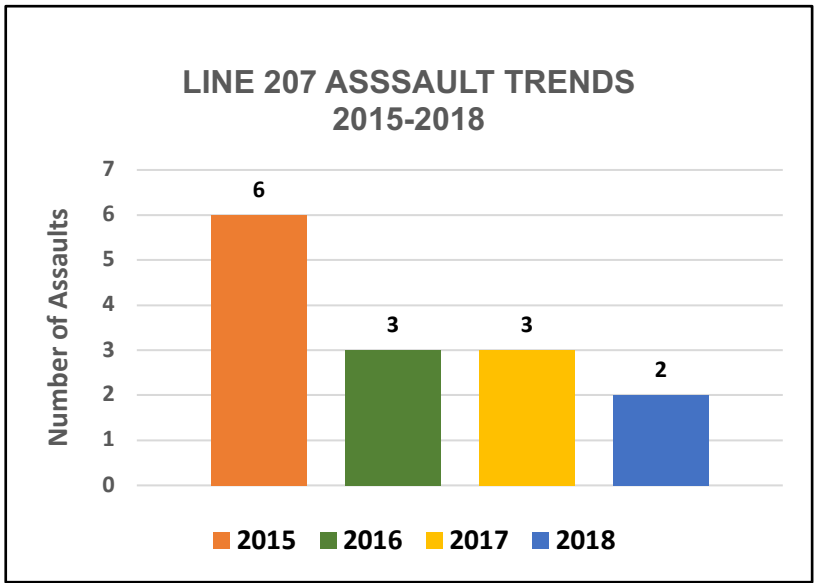

MOST COMMON OPERATOR ASSAULTS (2015-2018)
NUMBER OF ASSAULTS
200
150
100
50
0
150
111
22
10
8
Hit/Punched
Spit
Threw Liquid
With Knife
Grabbed
ASSAULT TYPE

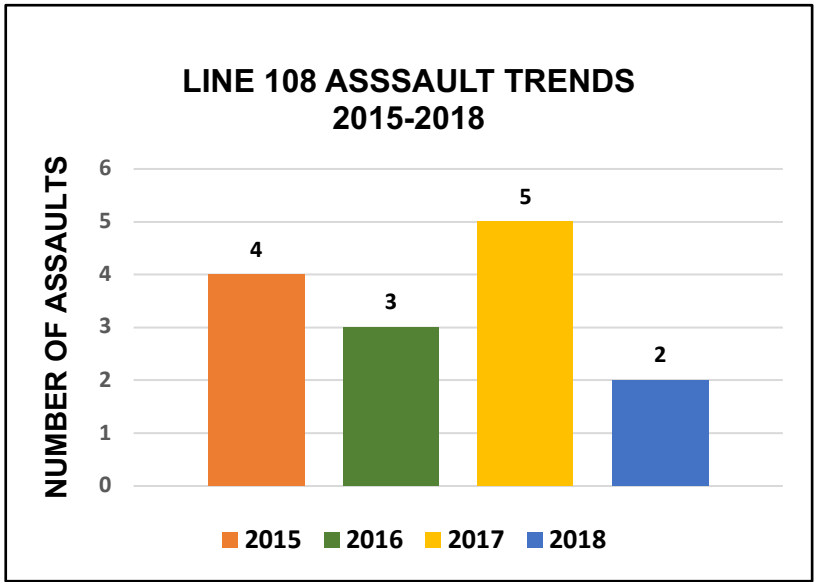

TOP REASONS FOR ASSAULTS (2015-2018)
NUMBER OF ASSAULTS
90
80
70
60
50
40
30
20
10
0
81
36
21
17
13
Fare Dispute
Policy Violation
Missed Stop
Demanded Stop
Asked Patron to Exit
REASON

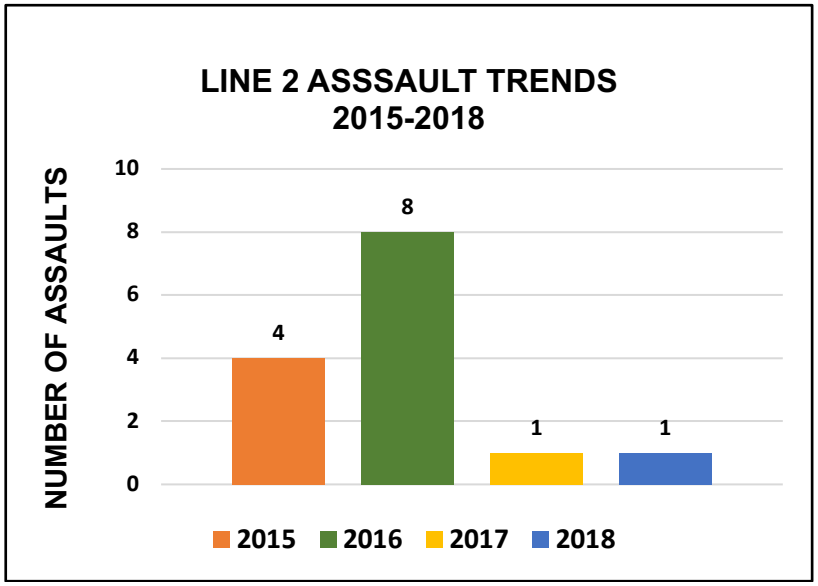

MOST PROMINENT TIMES FOR ASSAULTS (2015-2018)
NUMBER OF ASSAULTS
40
35
30
25
20
15
10
5
0
37
35
34
30
29
23
22
21
21
20
19
15:00
14:00
16:00
13:00
17:00
11:00
12:00
18:00
10:00
07:00
19:00
HOUR


SUMMARY OF ASSAULTS (2016-2018)
NUMBER OF ASSAULTS
120
100
80
60
40
20
0
111
103
80
4
16
26
2016
2017
2018
With Monitor Installed
Total Assaults


LINE 720 ASSSAULT TRENDS
2015-2018
NUMBER OF ASSAULTS
8
7
6
5
4
3
2
1
0
7
3
3
4
2015
2016
2017
2018

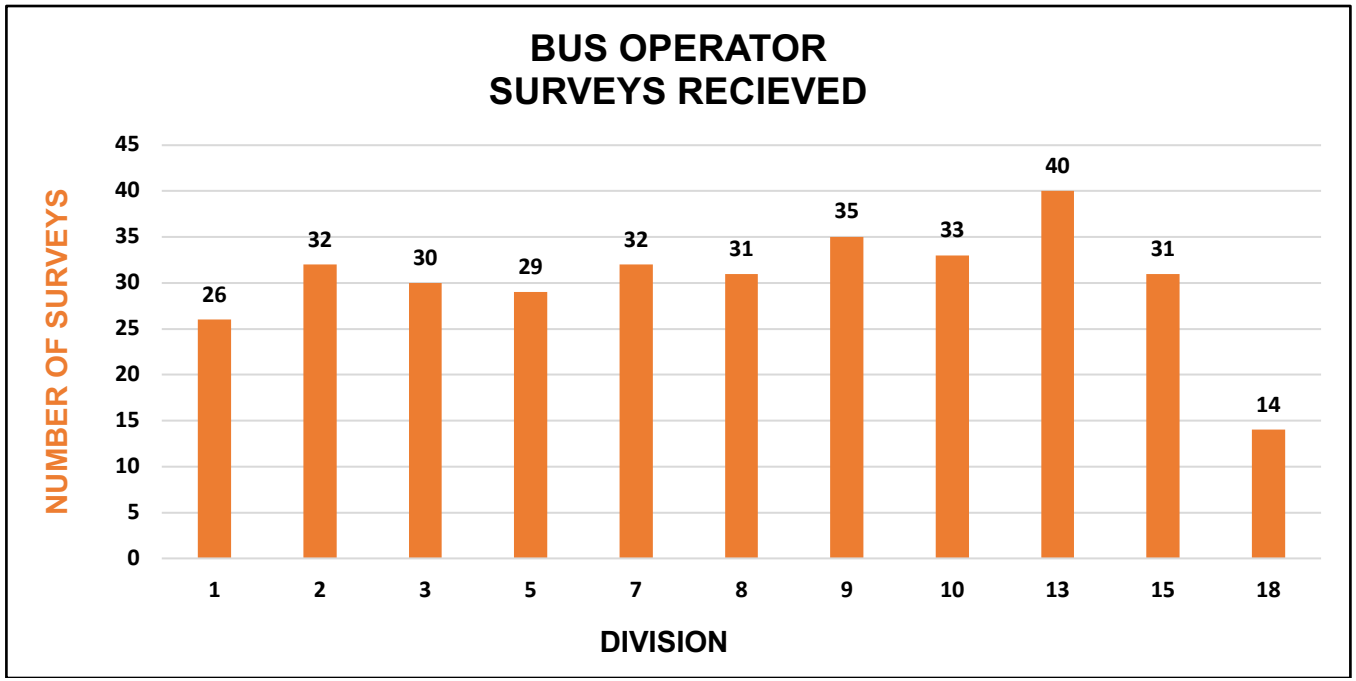

LINE 207 ASSSAULT TRENDS
2015-2018
Number of Assaults
7
6
5
4
3
2
1
0
6
3
3
2
2015
2016
2017
2018

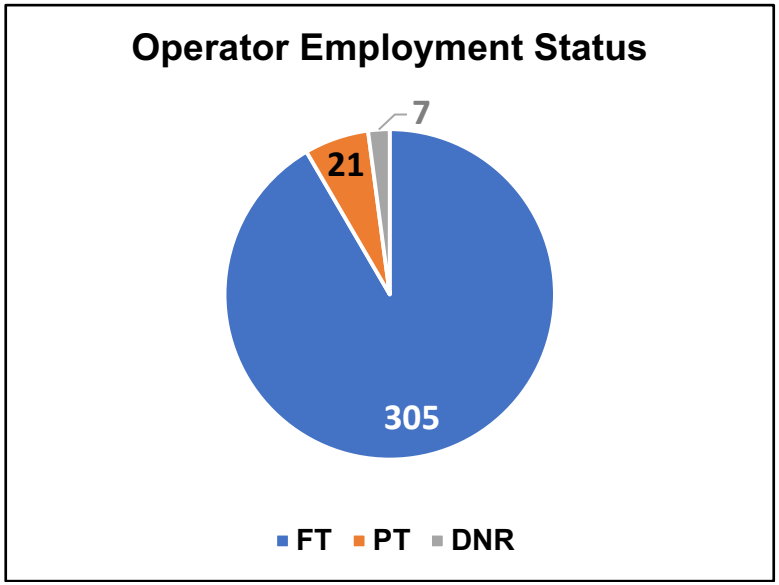

LINE 108 ASSSAULT TRENDS
2015-2018
NUMBER OF ASSAULTS
6
5
4
3
2
1
0
4
3
5
2
2015
2016
2017
2018

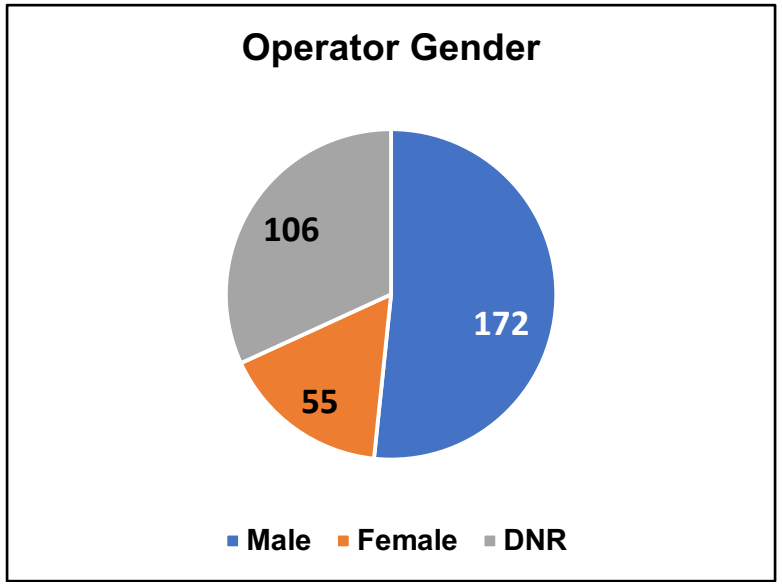

LINE 2 ASSSAULT TRENDS
2015-2018
NUMBER OF ASSAULTS
10
8
6
4
2
0
4
8
1
1
2015
2016
2017
2018

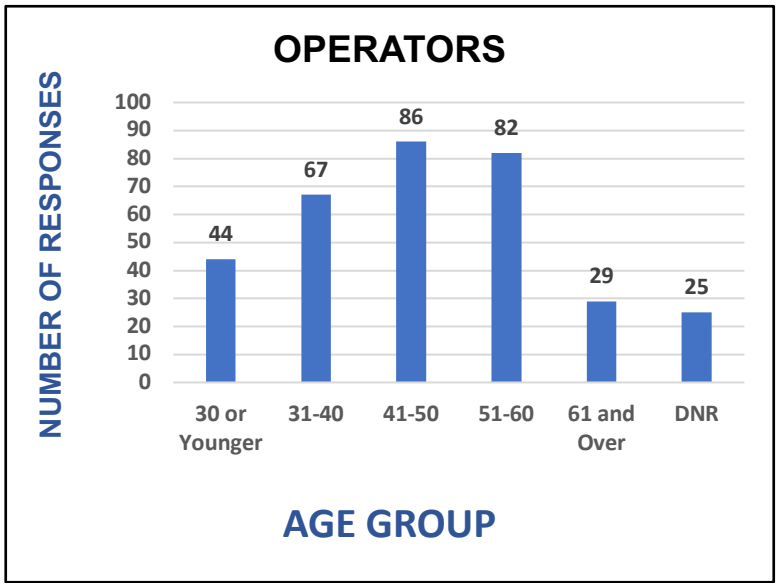
APPENDIX B – Bus Operator Survey Analysis Charts and Graphs

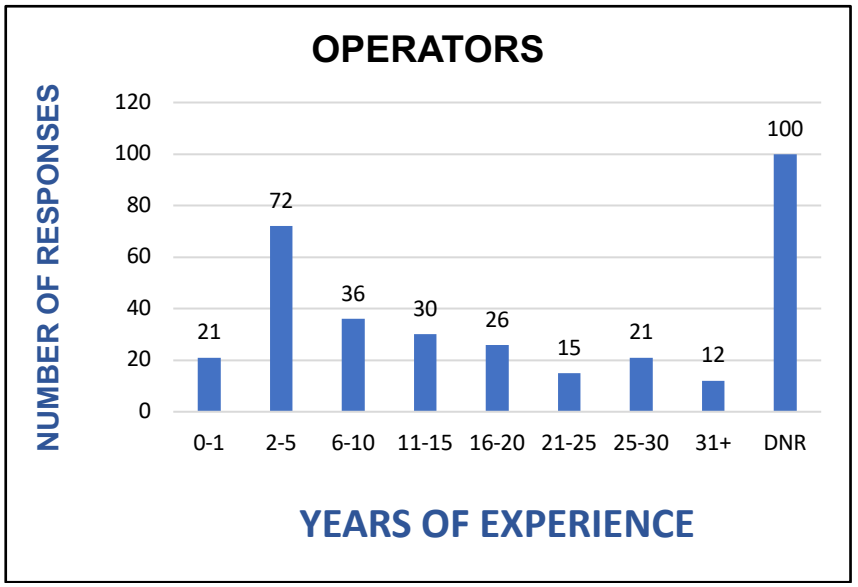
This Appendix contains the graphs and charts that were produced from analyzing the data provided in the Metro Bus Operator surveys.

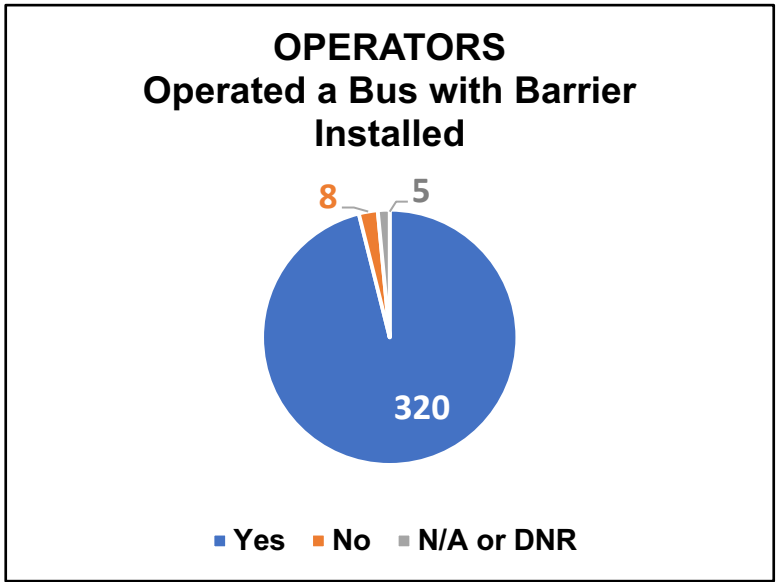


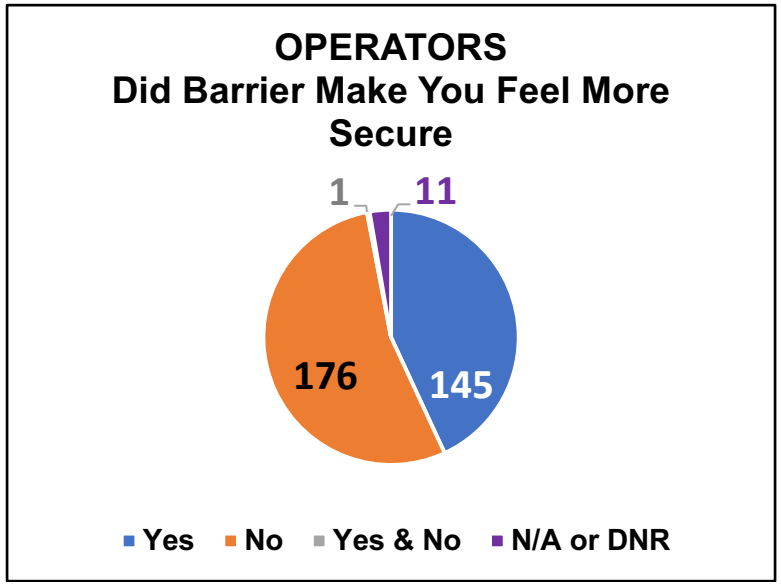

Operator Employment Status
7
21
305
FT
PT
DNR

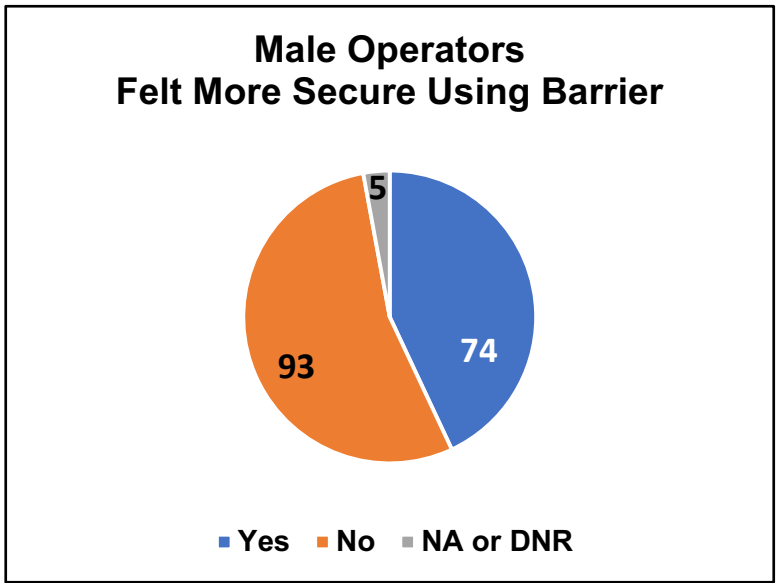

Operator Gender
106
172
55
Male
Female
DNR

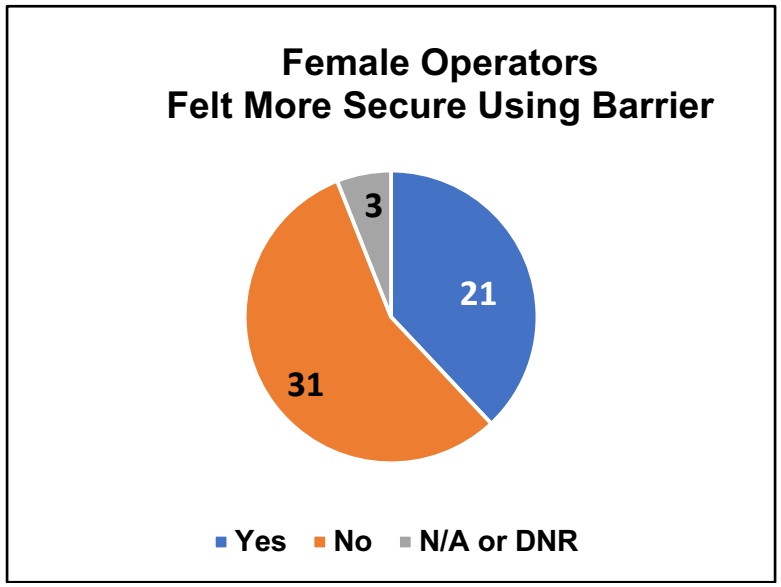

OPERATORS
NUMBER OF RESPONSES
100
90
80
70
60
50
40
30
20
10
0
44
67
86
82
29
25
30 or Younger
31-40
41-50
51-60
61 and Over
DNR
AGE GROUP

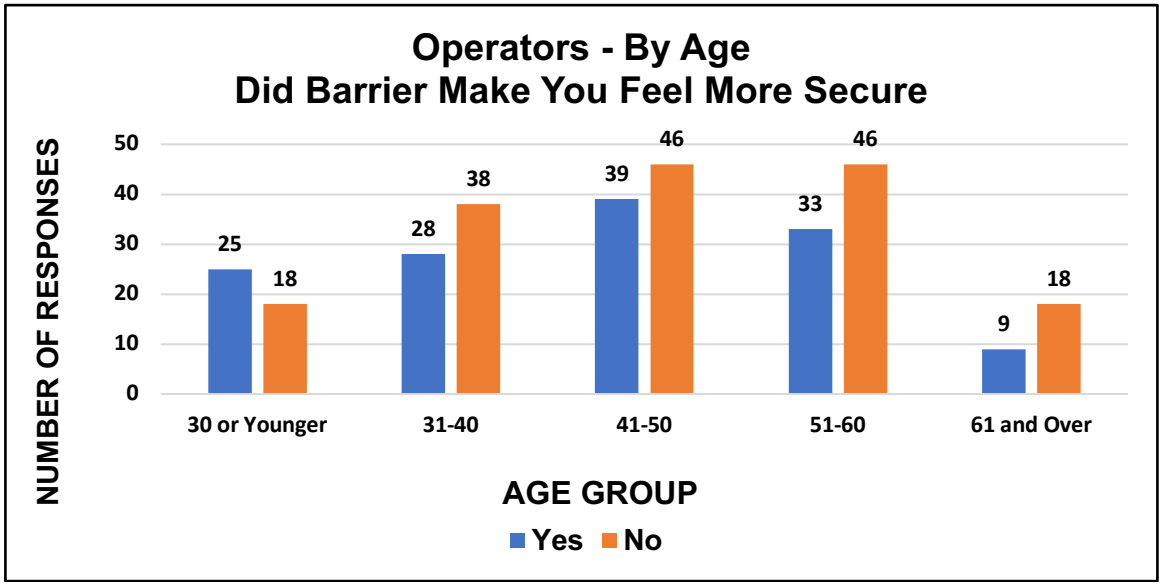

OPERATORS
NUMBER OF RESPONSES
120
100
80
60
40
20
0
21
72
36
30
26
15
21
12
100
0-1
2-5
6-10
11-15
16-20
21-25
25-30
31+
DNR
YEARS OF EXPERIENCE

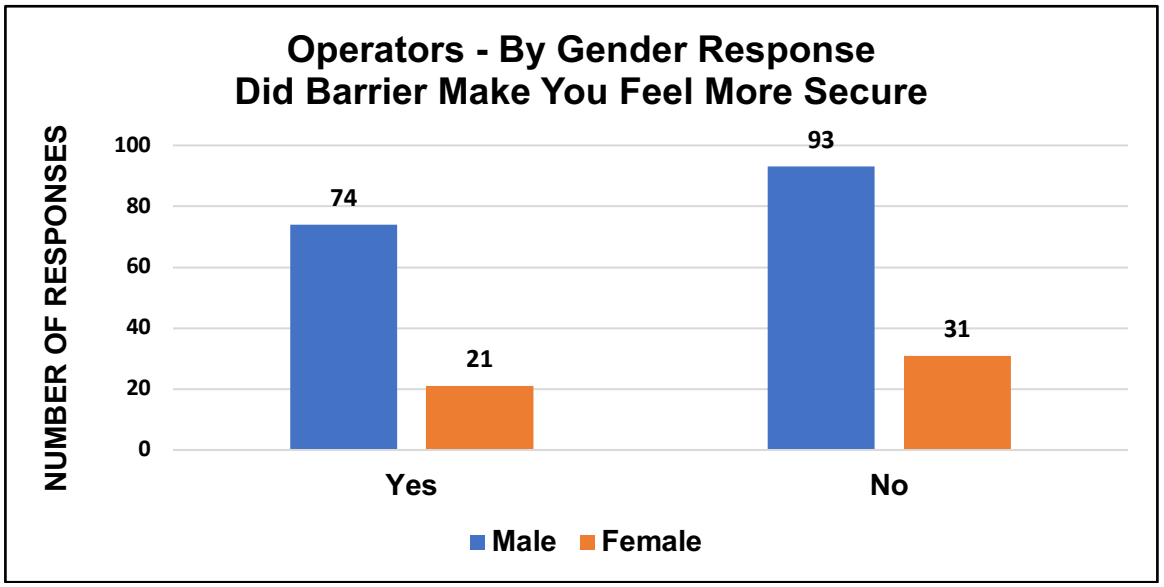

OPERATORS
Operated a Bus with Barrier Installed
8
5
320
Yes
No
N/A or DNR

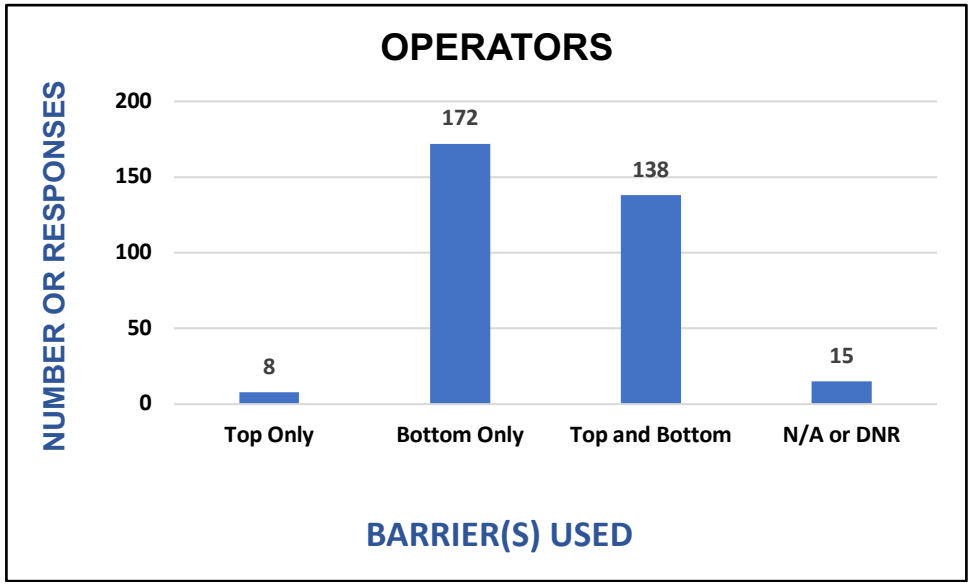

OPERATORS
Did Barrier Make You Feel More Secure
1
11
176
145
Yes
No
Yes & No
N/A or DNR

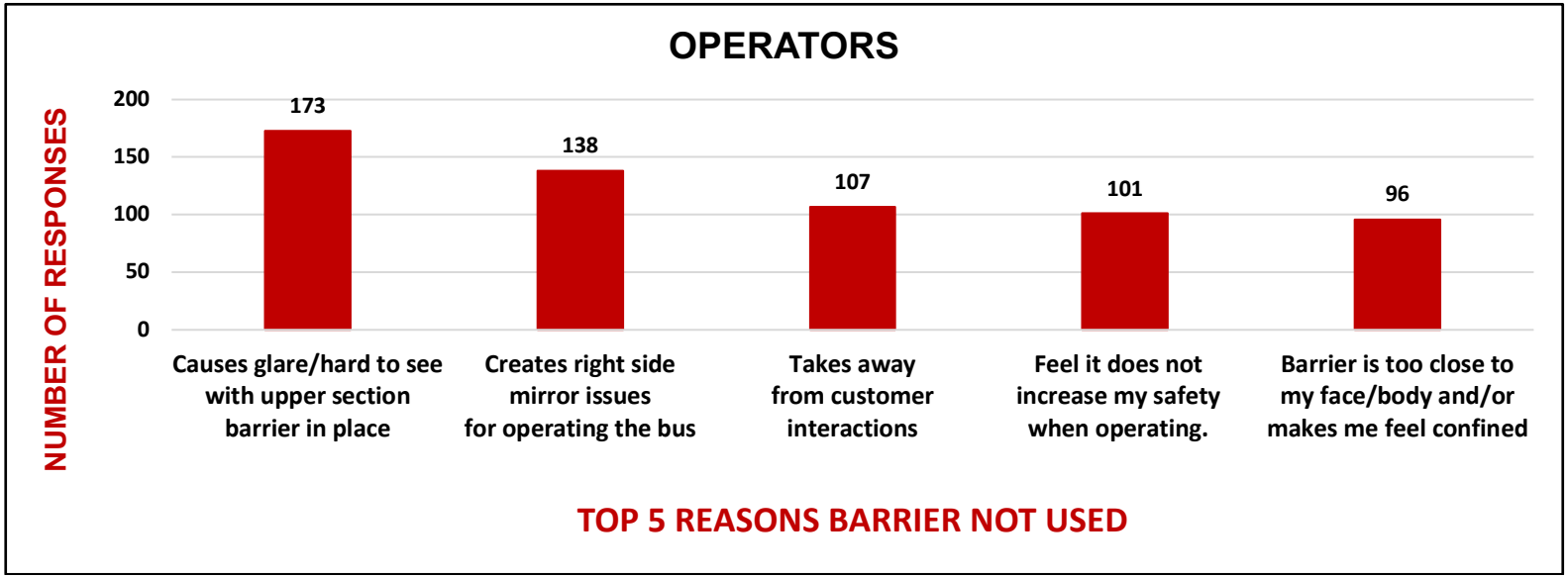

Male Operators
Felt More Secure Using Barrier
5
93
74
Yes
No
NA or DNR

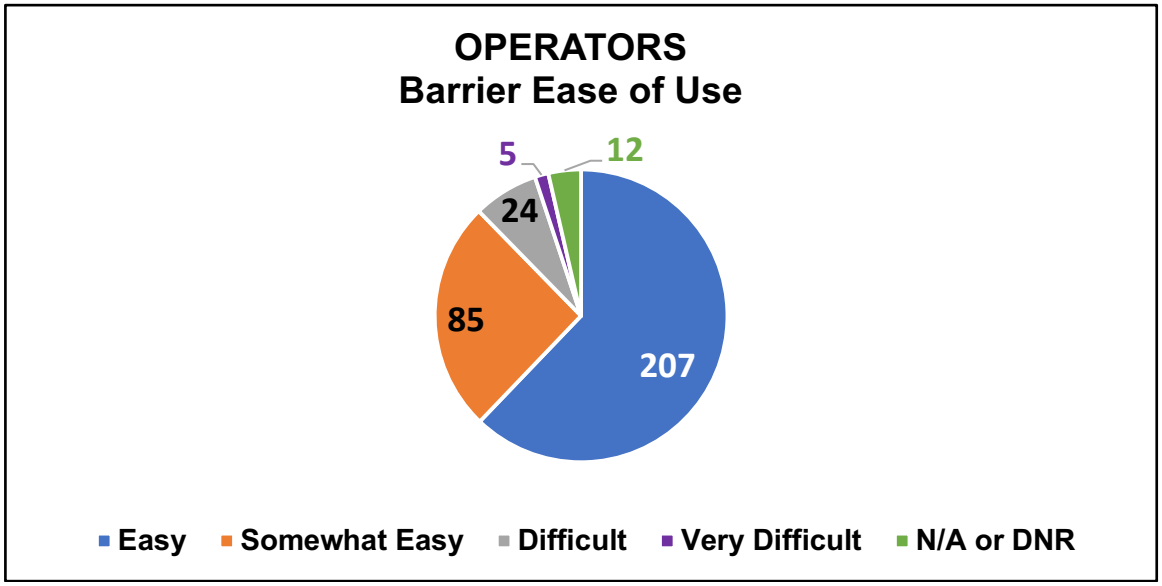

Female Operators
Felt More Secure Using Barrier
3
21
31
Yes
No
N/A or DNR

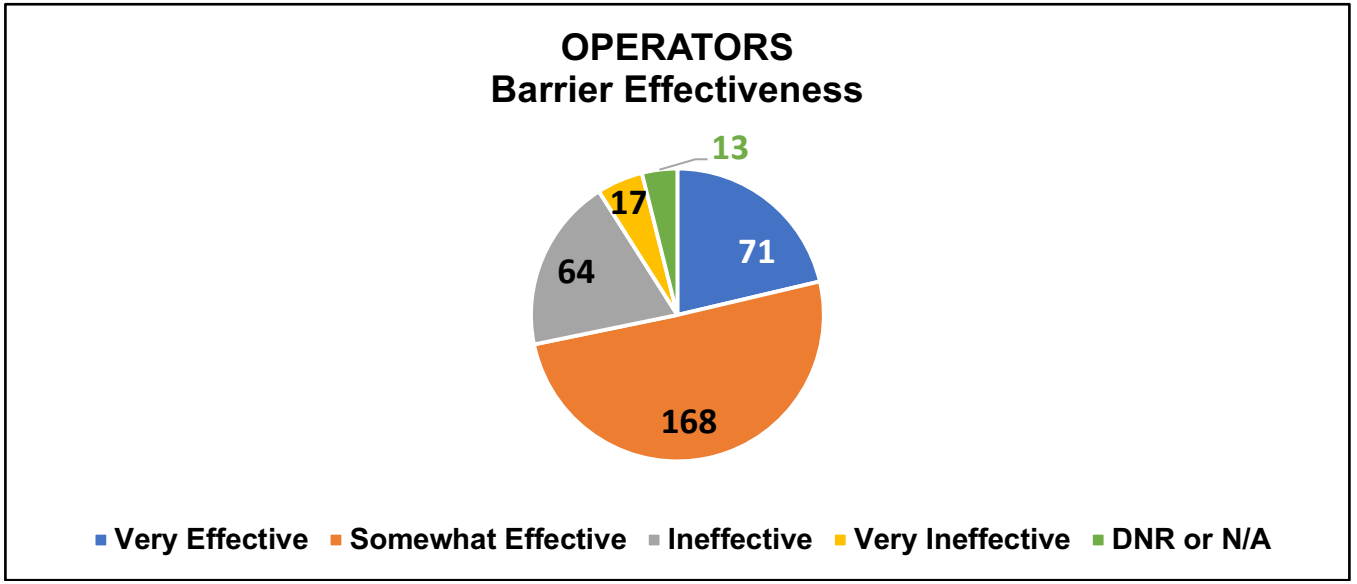

Operators - By Age
Did Barrier Make You Feel More Secure
NUMBER OF RESPONSES
50
40
30
20
10
0
25
18
28
38
39
46
33
46
9
18
30 or Younger
31-40
41-50
51-60
61 and Over
AGE GROUP
Yes
No

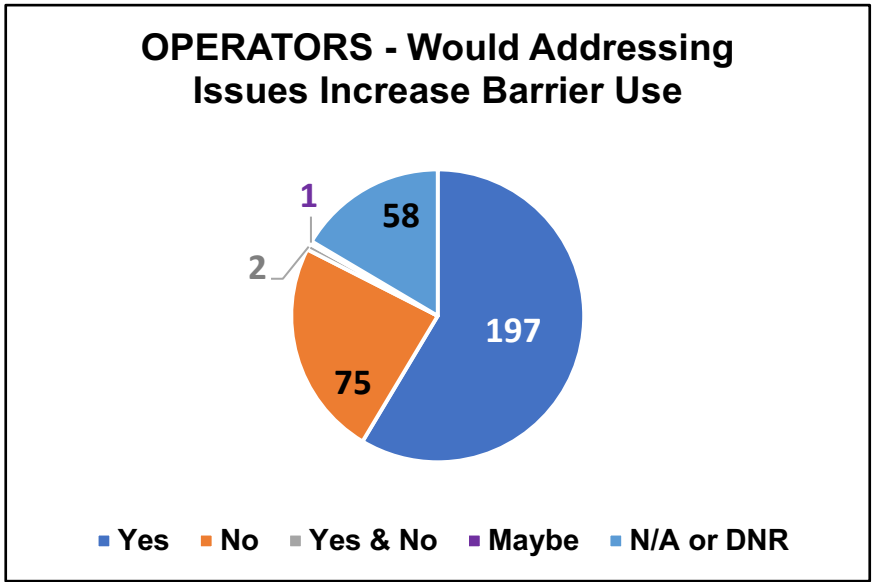

Operators - By Gender Response
Did Barrier Make You Feel More Secure
NUMBER OF RESPONSES
100
80
60
40
20
0
74
21
93
31
Yes
No
Male
Female

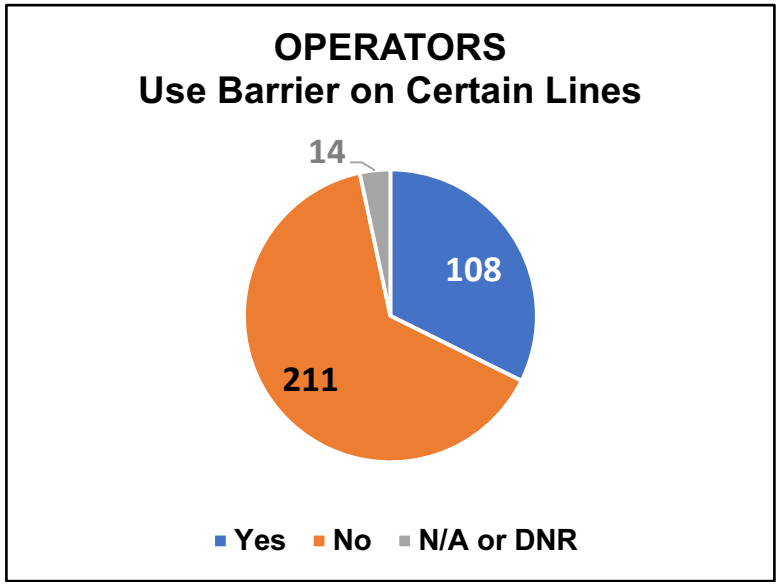

OPERATORS
NUMBER OR RESPONSES
200
150
100
50
0
172
138
8
15
Top Only
Bottom Only
Top and Bottom
N/A or DNR
BARRIER(S) USED

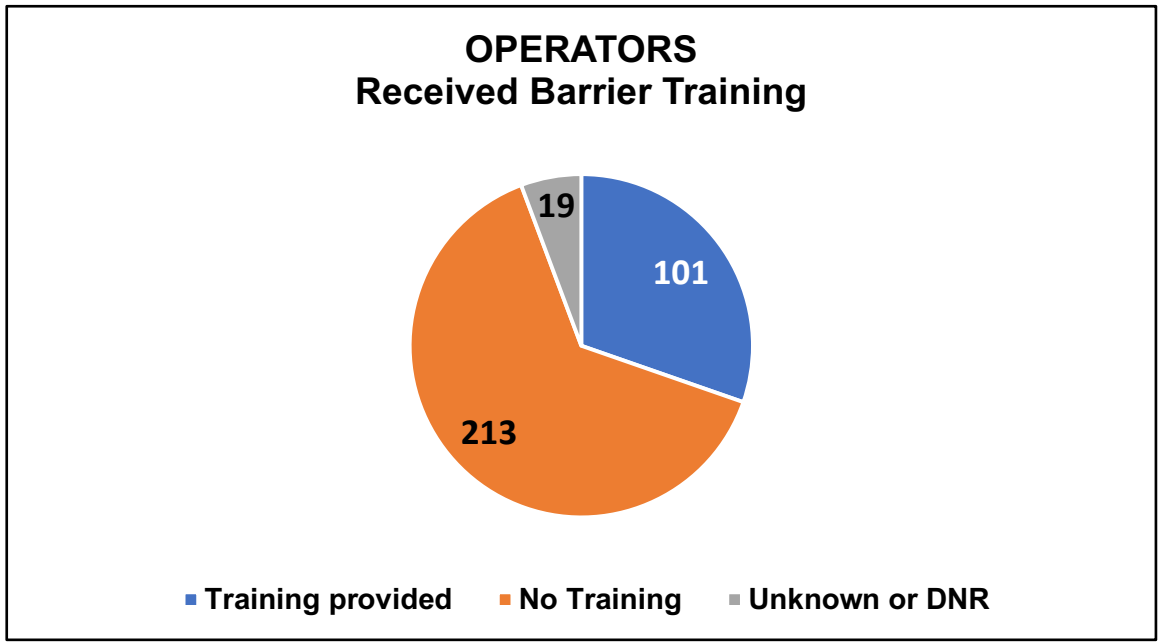

OPERATORS
NUMBER OF RESPONSES
200
150
100
50
0
173
138
107
101
96
Causes glare/hard to see with upper section barrier in place
Creates right side mirror issues for operating the bus
Takes away from customer interactions
Feel it does not increase my safety when operating.
Barrier is too close to my face/body and/or makes me feel confined
TOP 5 REASONS BARRIER NOT USED

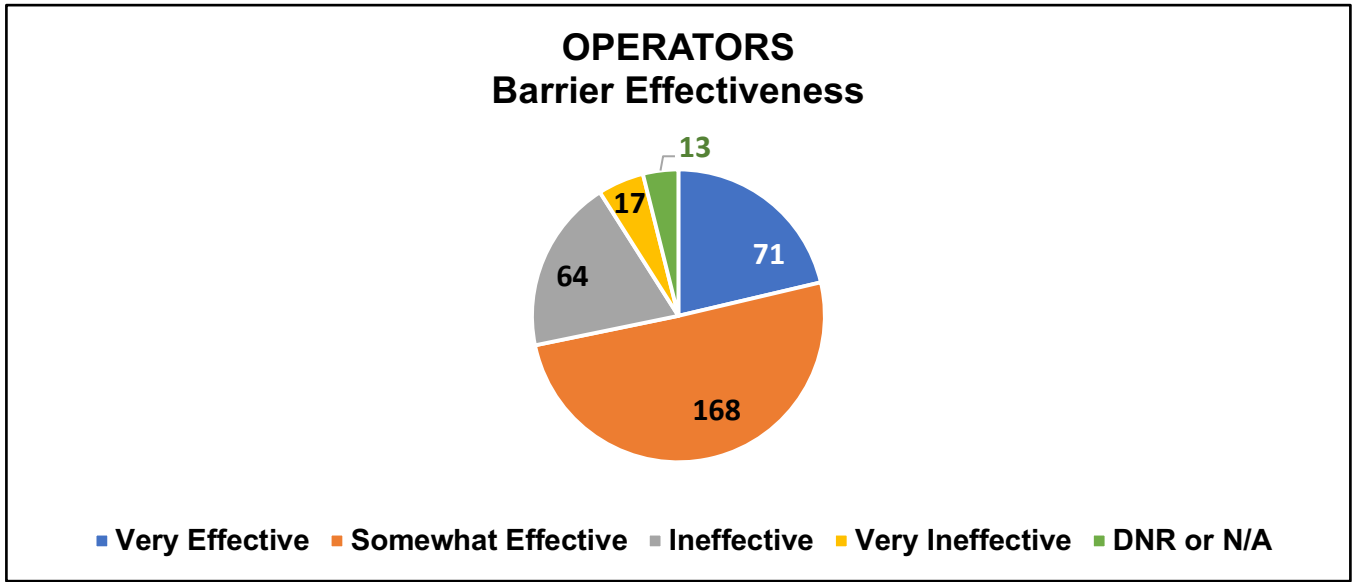

OPERATORS
Barrier Ease of Use
5
12
24
85
207
Easy
Somewhat Easy
Difficult
Very Difficult
N/A or DNR

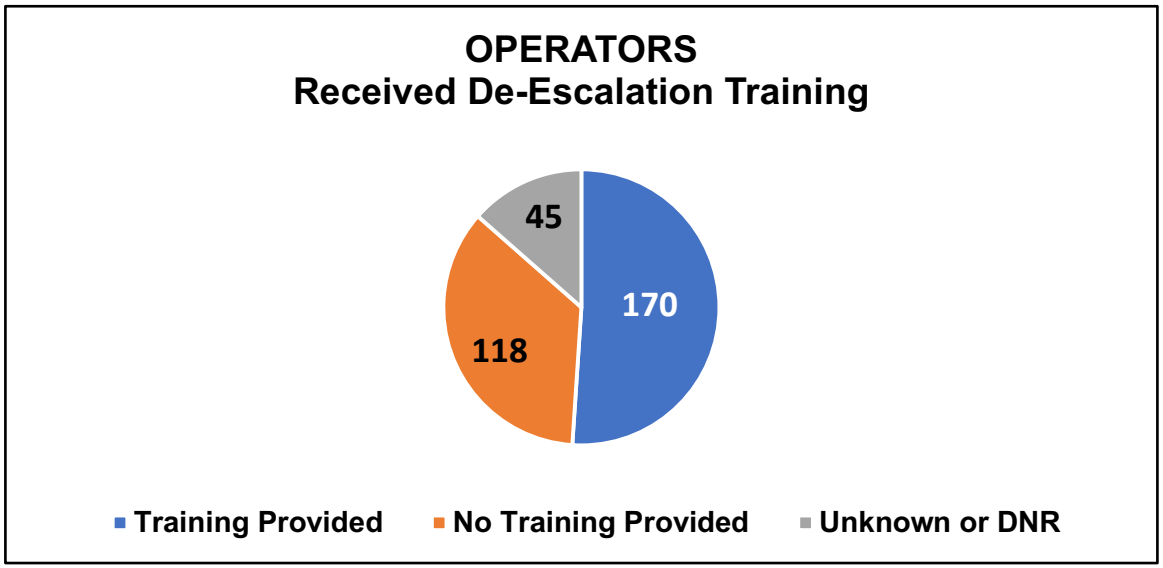

OPERATORS
Barrier Effectiveness
13
17
71
64
168
Very Effective
Somewhat Effective
Ineffective
Very Ineffective
DNR or N/A

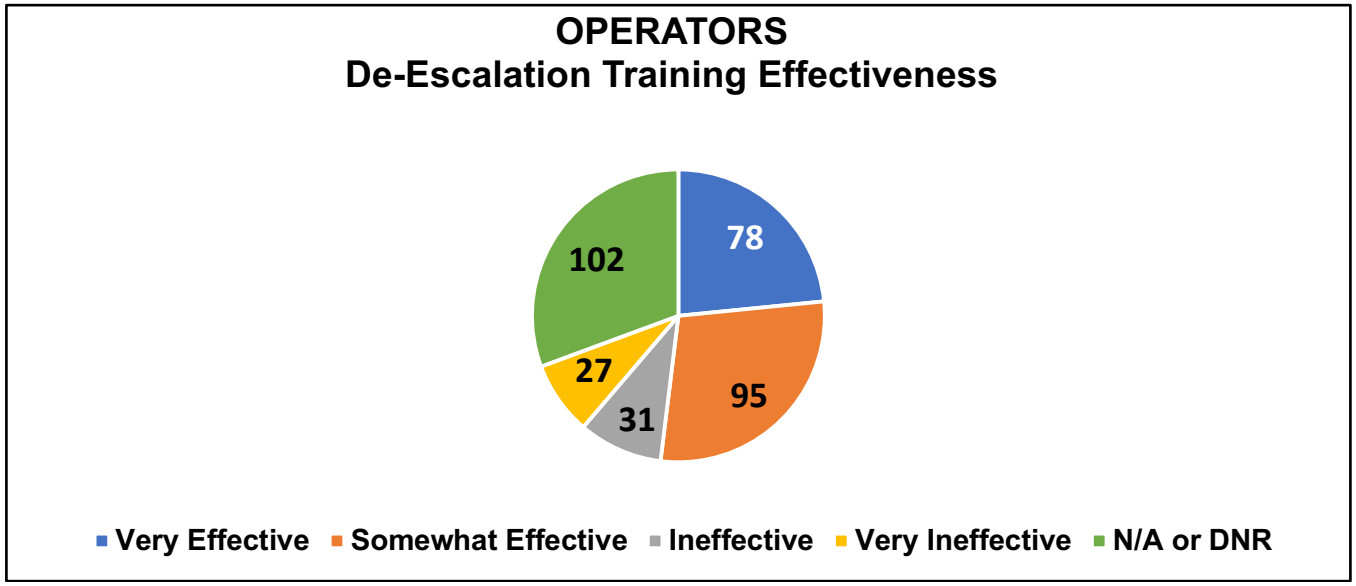

OPERATORS - Would Addressing Issues Increase Barrier Use
1
58
2
197
75
Yes
No
Yes & No
Maybe
N/A or DNR

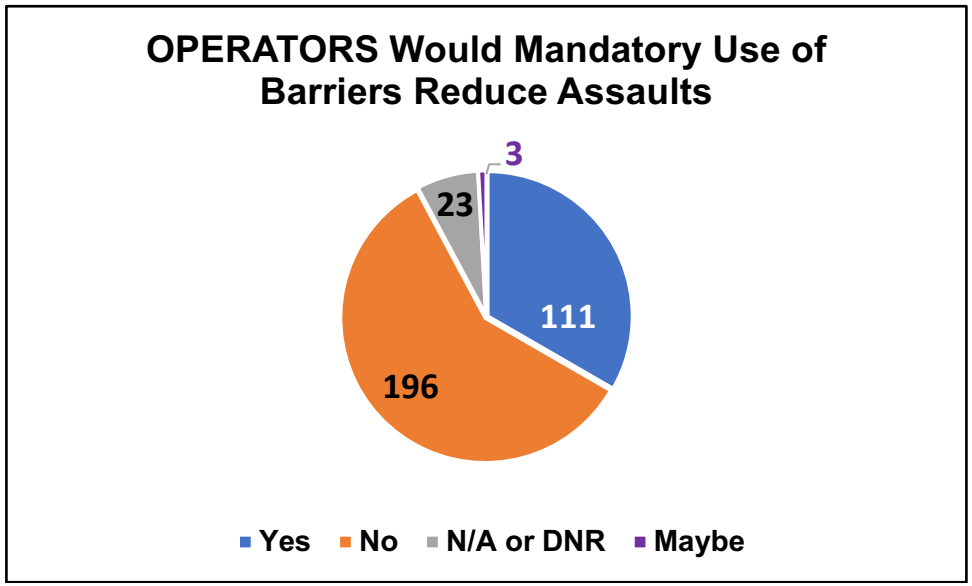

OPERATORS Use Barrier on Certain Lines
14
108
211
Yes
No
N/A or DNR

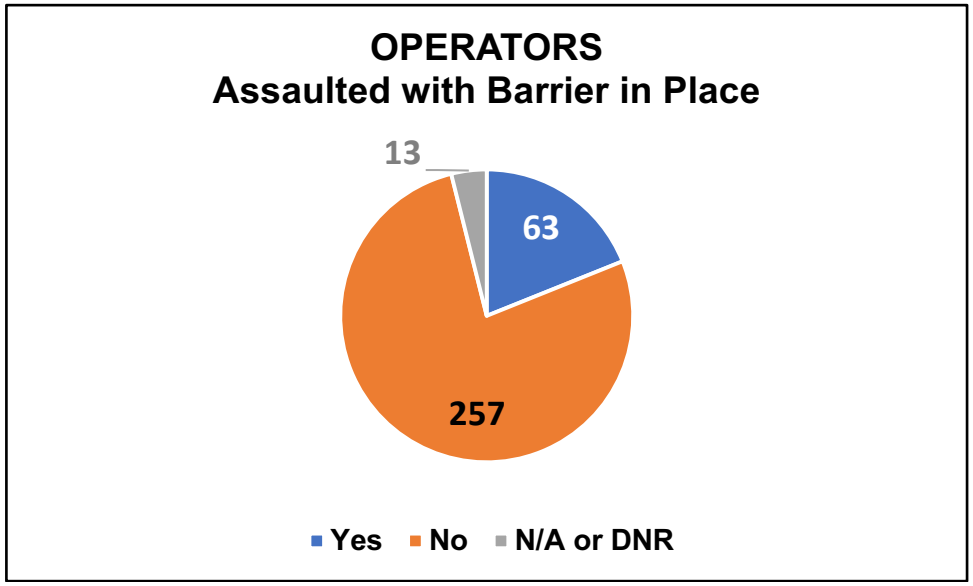

OPERATORS Received Barrier Training
19
101
213
Training provided
No Training
Unknown or DNR

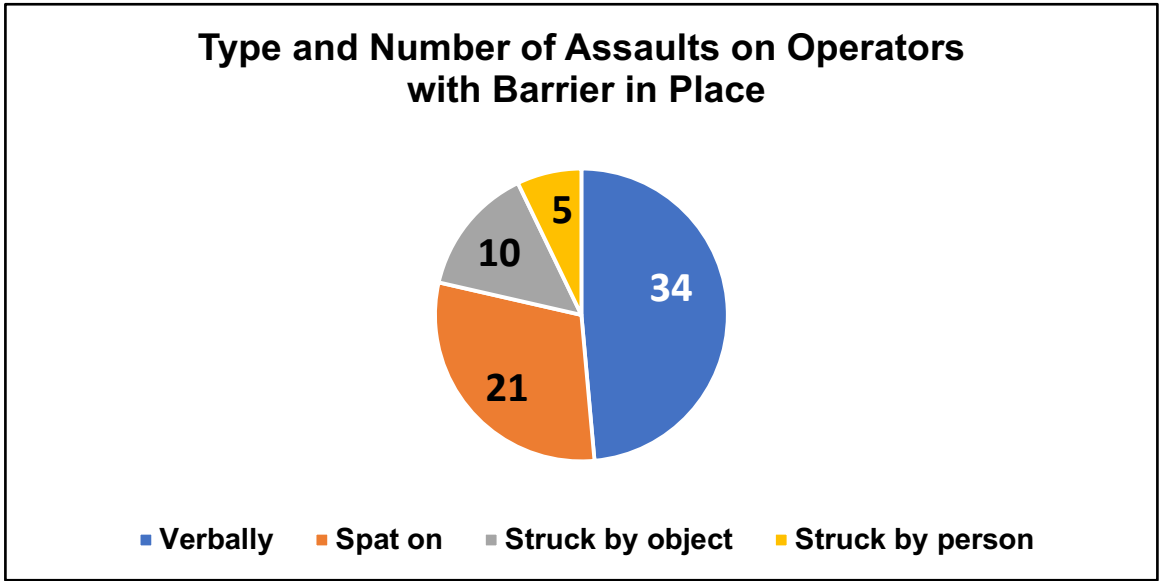

OPERATORS
Barrier Effectiveness
13
17
71
64
168
Very Effective
Somewhat Effective
Ineffective
Very Ineffective
DNR or N/A

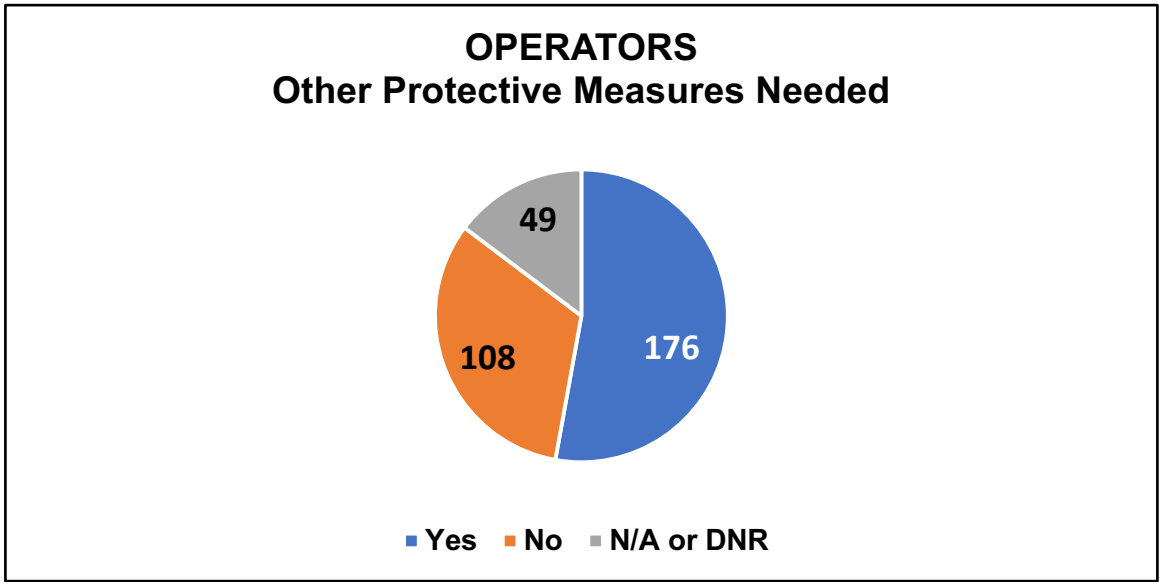

OPERATORS
Received De-Escalation Training
45
170
118
Training Provided
No Training Provided
Unknown or DNR


OPERATORS
De-Escalation Training Effectiveness
78
95
31
27
102
Very Effective
Somewhat Effective
Ineffective
Very Ineffective
N/A or DNR


OPERATORS Would Mandatory Use of Barriers Reduce Assaults
3
23
111
196
Yes
No
N/A or DNR
Maybe

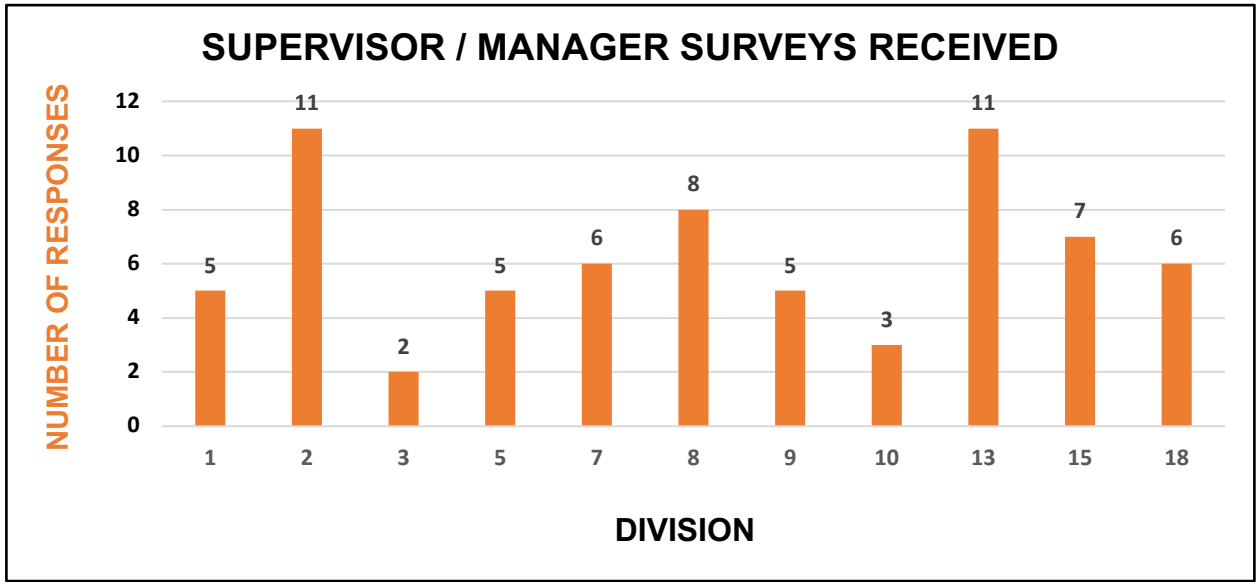

OPERATORS
Assaulted with Barrier in Place
13
63
257
Yes
No
N/A or DNR

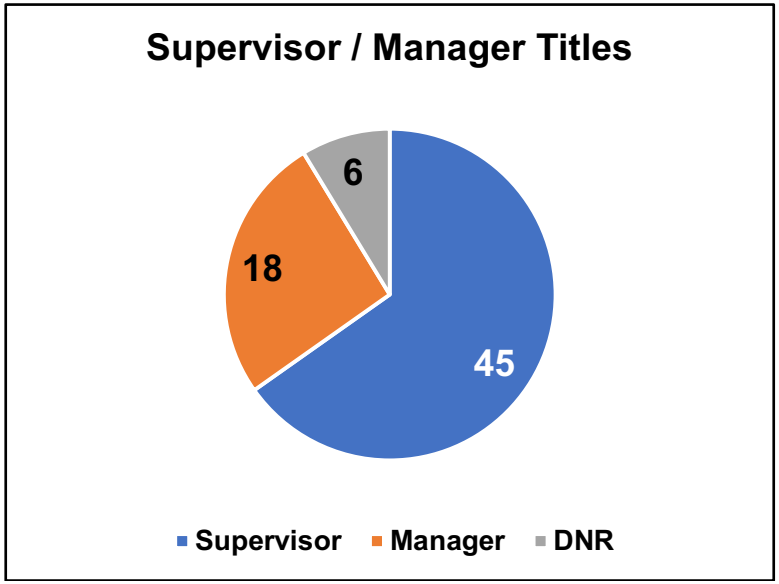

Type and Number of Assaults on Operators
with Barrier in Place
5
10
34
21
Verbally
Spat on
Struck by object
Struck by person

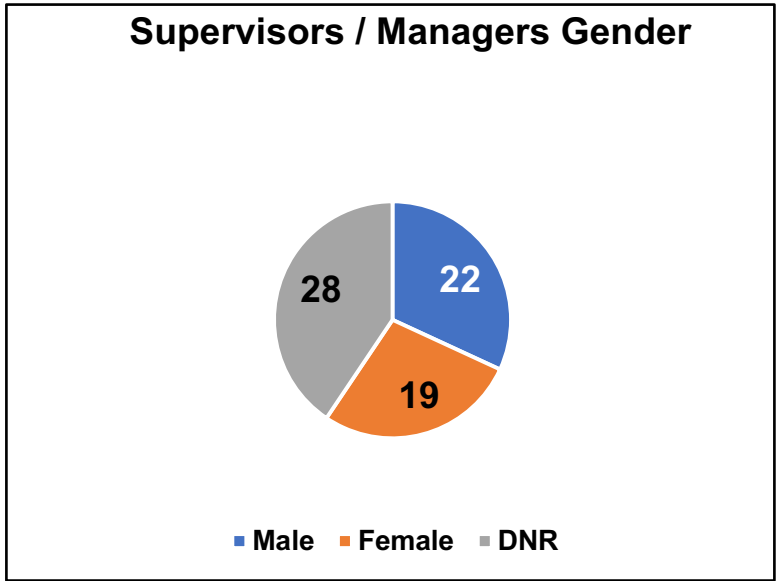

OPERATORS
Other Protective Measures Needed
49
108
176
Yes
No
N/A or DNR

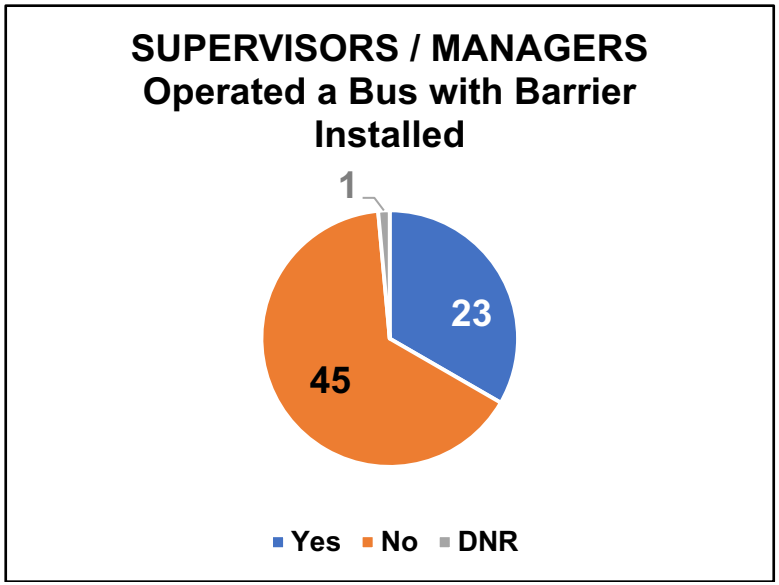
APPENDIX C – Bus Supervisor/Manager Survey Analysis Charts and Graphs

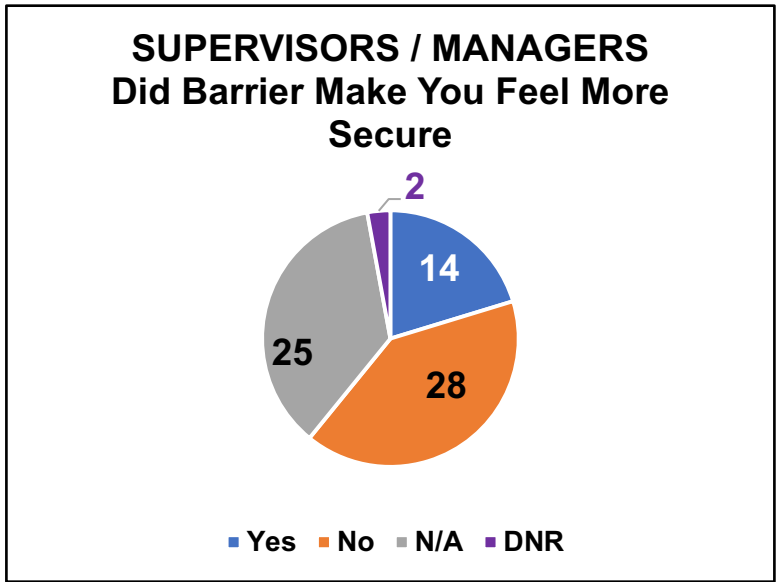
Appendix C contains the graphs and charts that were produced from analyzing the data provided in the Metro Bus Supervisor/Manager surveys.

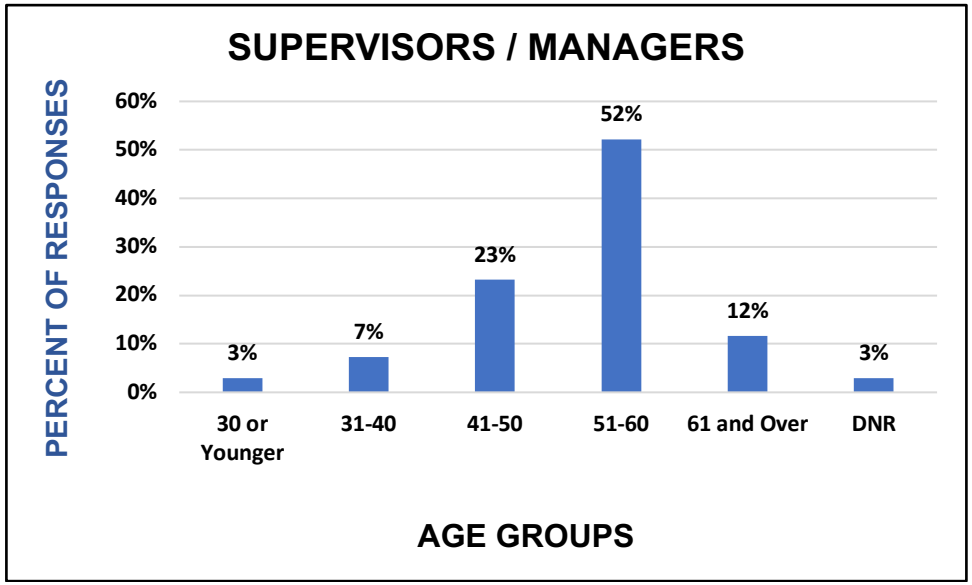


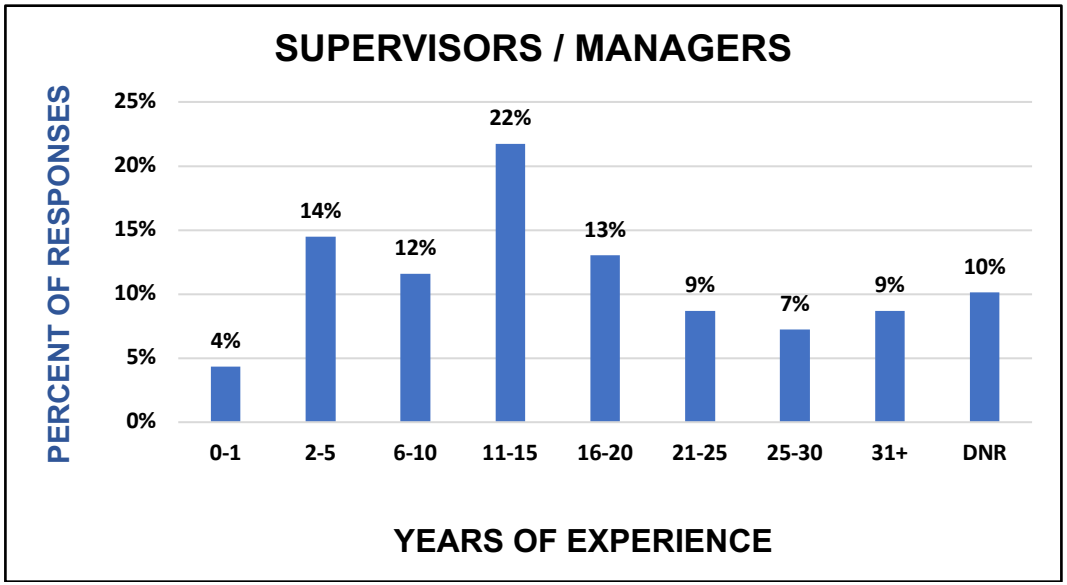

Supervisor / Manager Titles
6
18
45
Supervisor
Manager
DNR

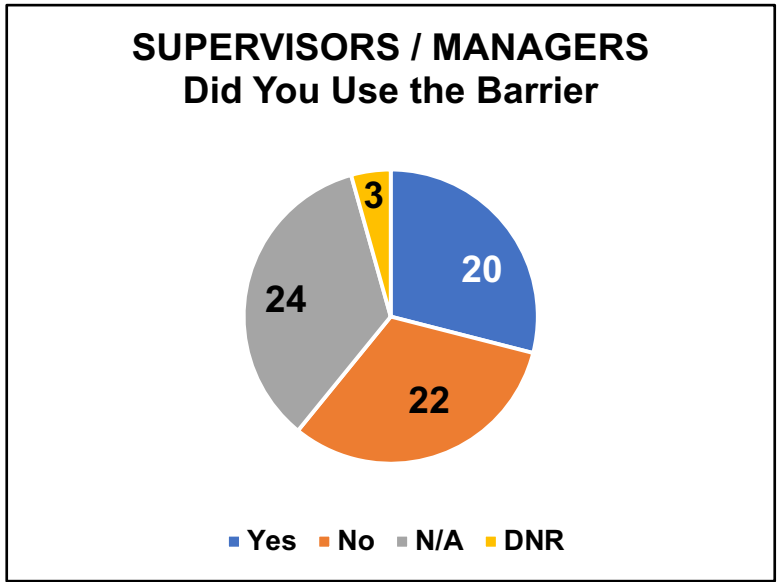

Supervisors / Managers Gender
28
22
19
Male
Female
DNR

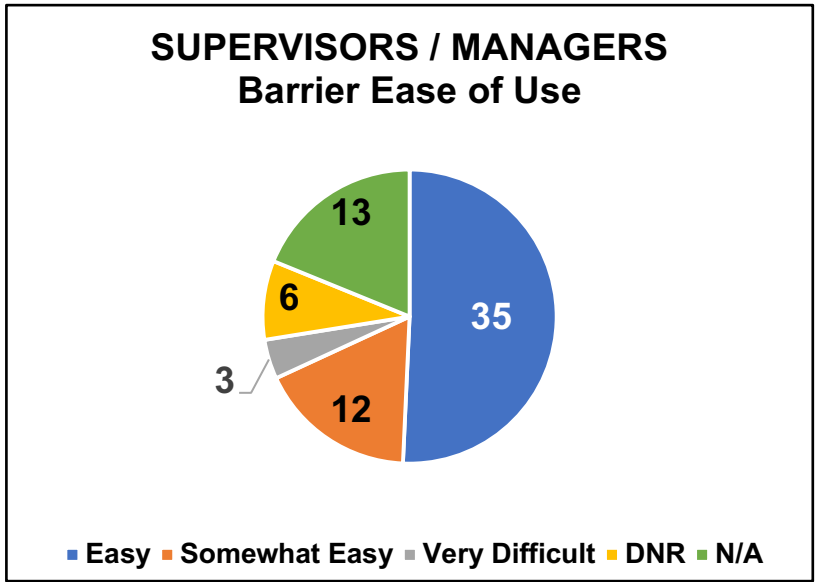

SUPERVISORS / MANAGERS
Operated a Bus with Barrier Installed
1
23
45
Yes
No
DNR

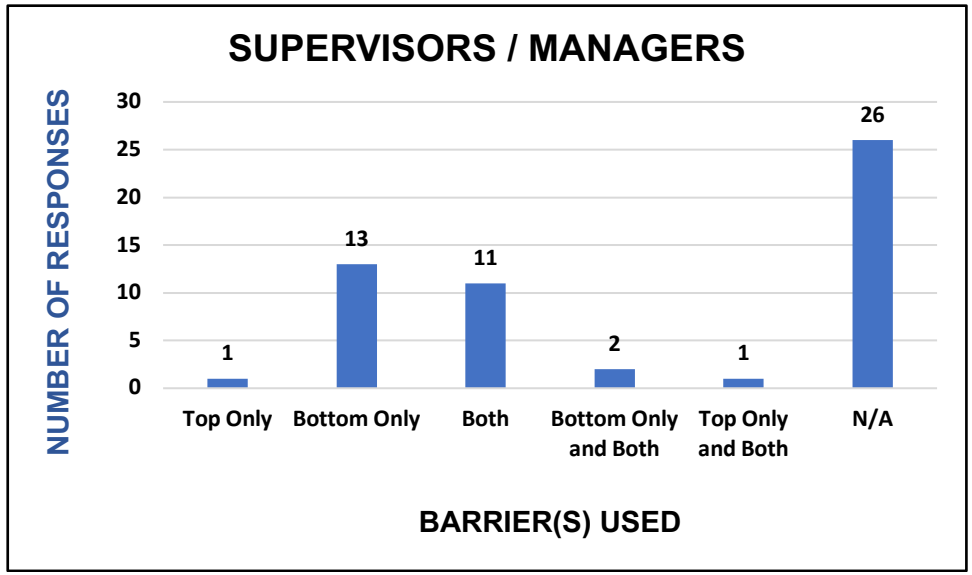

SUPERVISORS / MANAGERS
Did Barrier Make You Feel More Secure
2
14
25
28
Yes
No
N/A
DNR

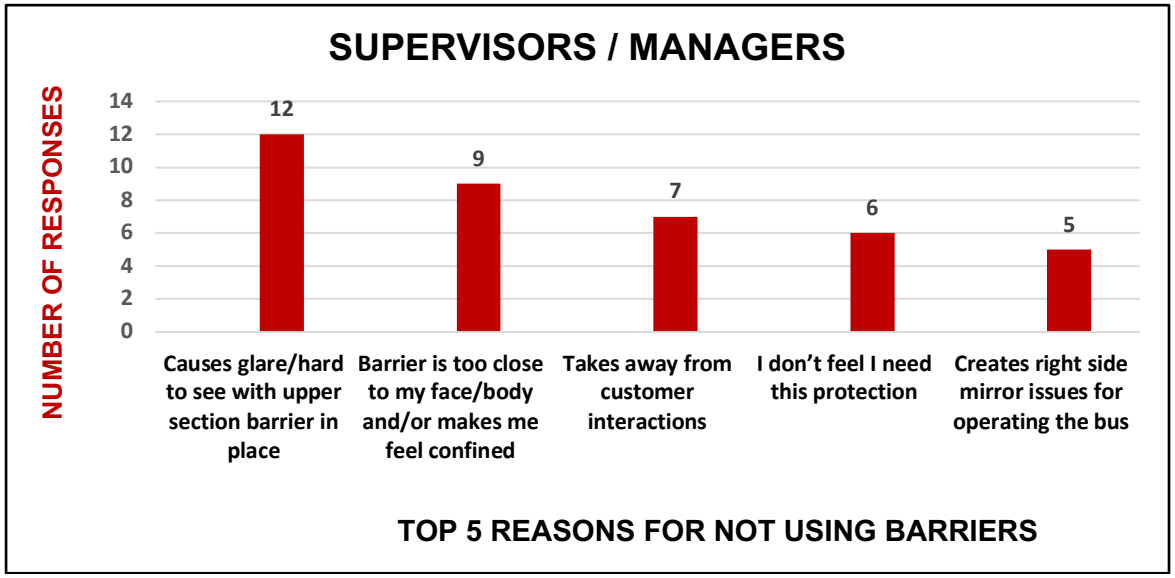

SUPERVISORS / MANAGERS
PERCENT OF RESPONSES
60%
50%
40%
30%
20%
10%
0%
3%
7%
23%
52%
12%
3%
30 or Younger
31-40
41-50
51-60
61 and Over
DNR
AGE GROUPS

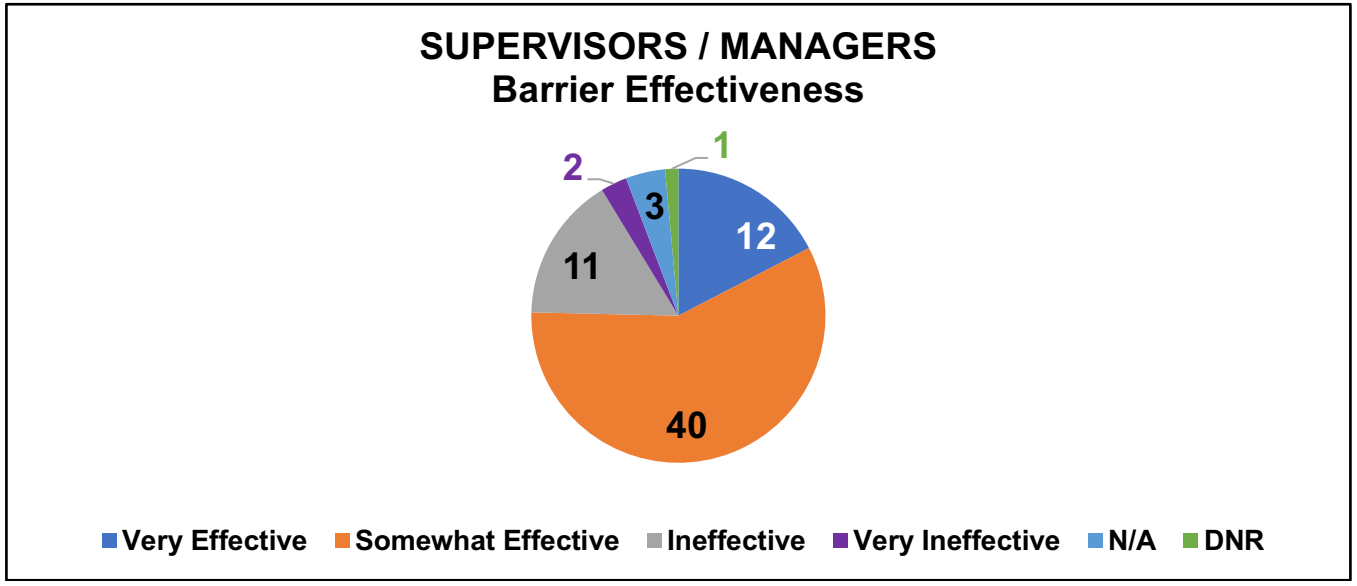

SUPERVISORS / MANAGERS
PERCENT OF RESPONSES
25%
20%
15%
10%
5%
0%
4%
14%
12%
22%
13%
9%
7%
9%
10%
0-1
2-5
6-10
11-15
16-20
21-25
25-30
31+
DNR
YEARS OF EXPERIENCE

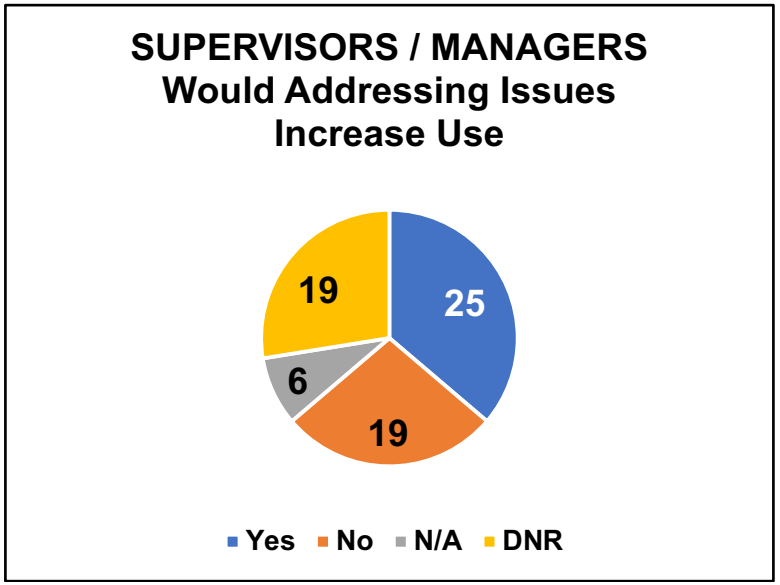

SUPERVISORS / MANAGERS
Did You Use the Barrier
20
22
24
3
Yes
No
N/A
DNR

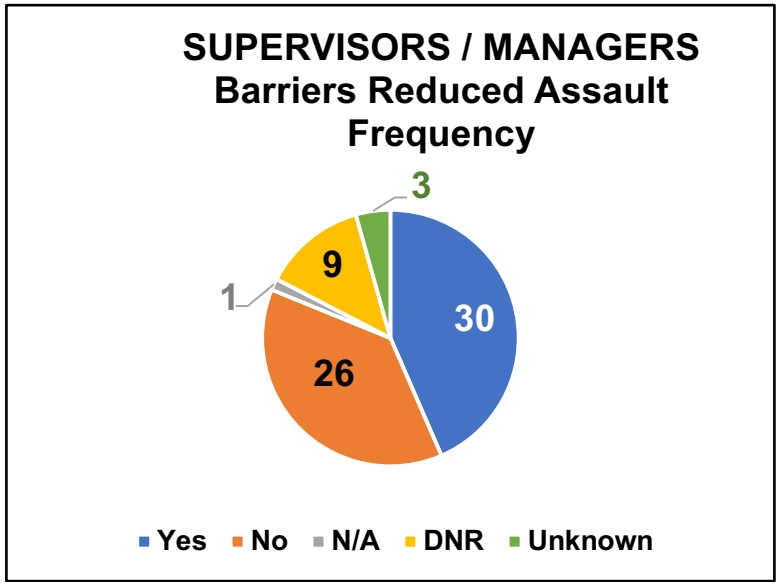

SUPERVISORS / MANAGERS
Barrier Ease of Use
35
12
3
6
13
Easy
Somewhat Easy
Very Difficult
DNR
N/A

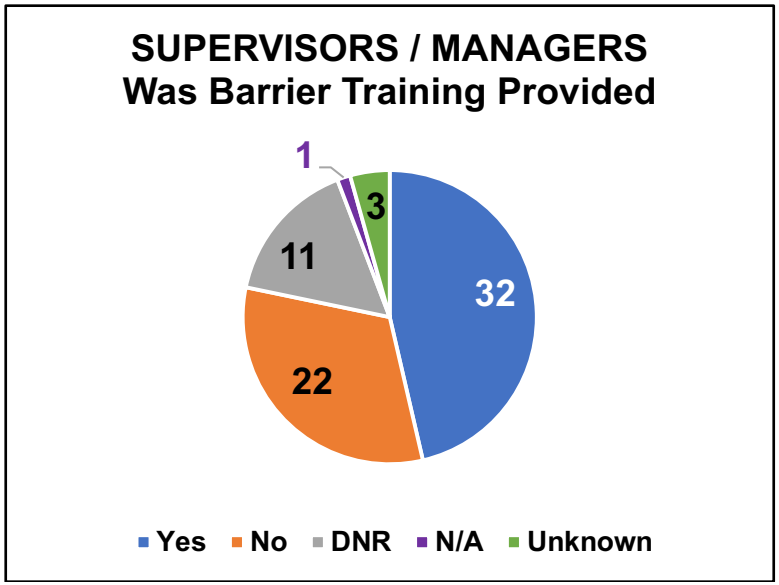

SUPERVISORS / MANAGERS
NUMBER OF RESPONSES
30
25
20
15
10
5
0
1
13
11
2
1
26
Top Only
Bottom Only
Both
Bottom Only and Both
Top Only and Both
N/A
BARRIER(S) USED

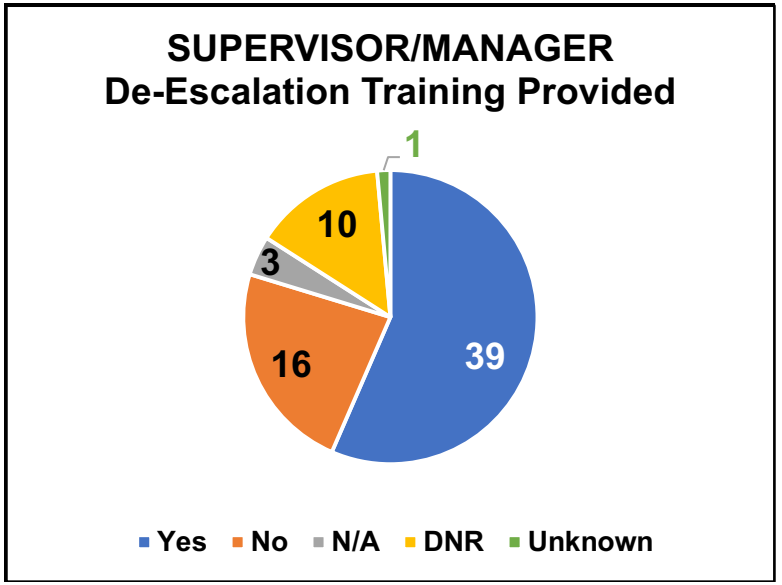

SUPERVISORS / MANAGERS
NUMBER OF RESPONSES
14
12
10
8
6
4
2
0
12
9
7
6
5
Causes glare/hard to see with upper section barrier in place
Barrier is too close to my face/body and/or makes me feel confined
Takes away from customer interactions
I don't feel I need this protection
Creates right side mirror issues for operating the bus
TOP 5 REASONS FOR NOT USING BARRIERS

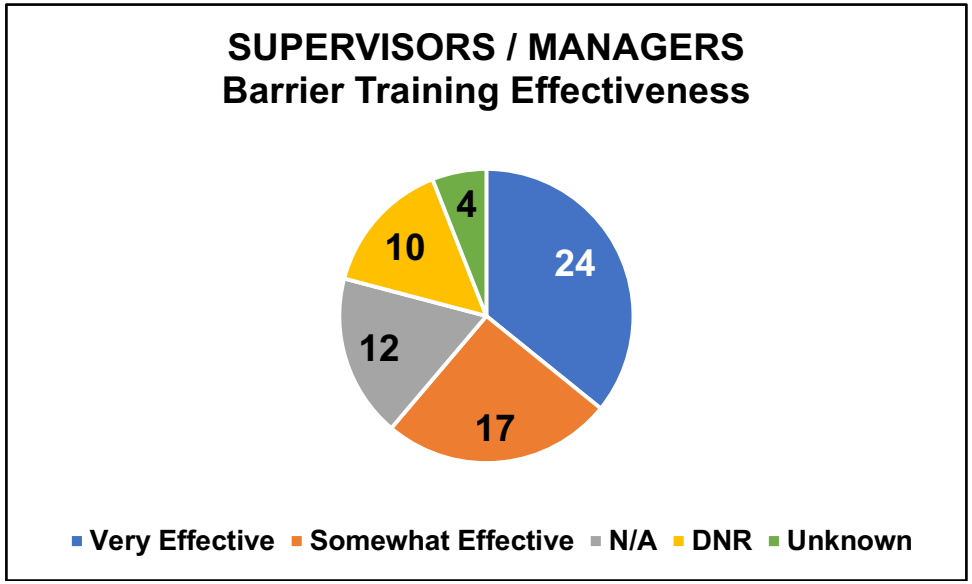

SUPERVISORS / MANAGERS
Barrier Effectiveness
12
40
11
2
3
1
Very Effective
Somewhat Effective
Ineffective
Very Ineffective
N/A
DNR

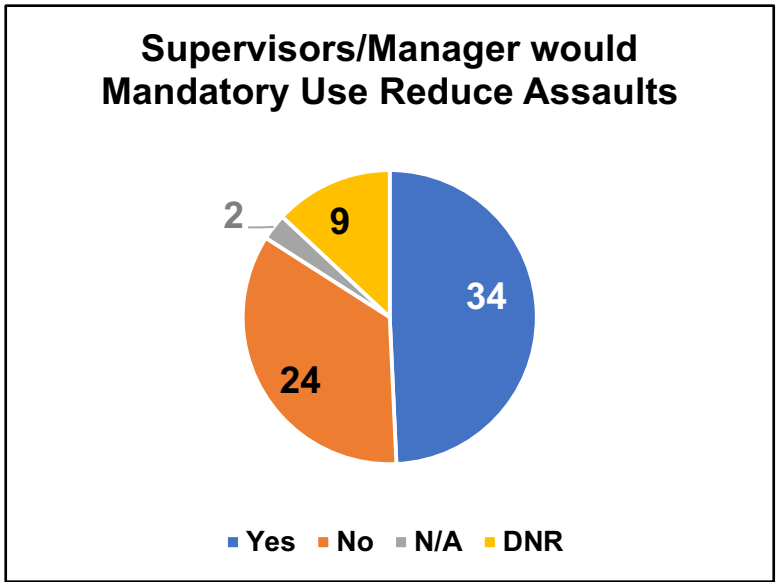

SUPERVISORS / MANAGERS
Would Addressing Issues Increase Use
25
19
6
19
Yes
No
N/A
DNR

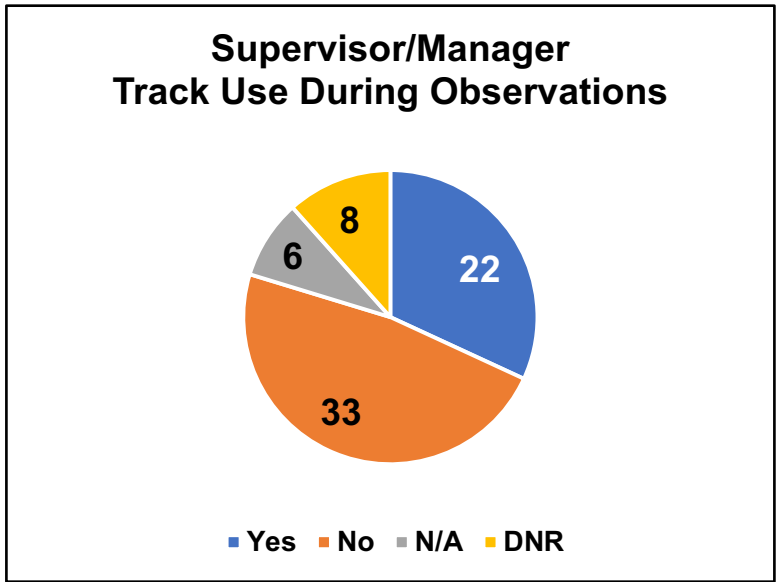

SUPERVISORS / MANAGERS
Barriers Reduced Assault Frequency
30
26
1
9
3
Yes
No
N/A
DNR
Unknown

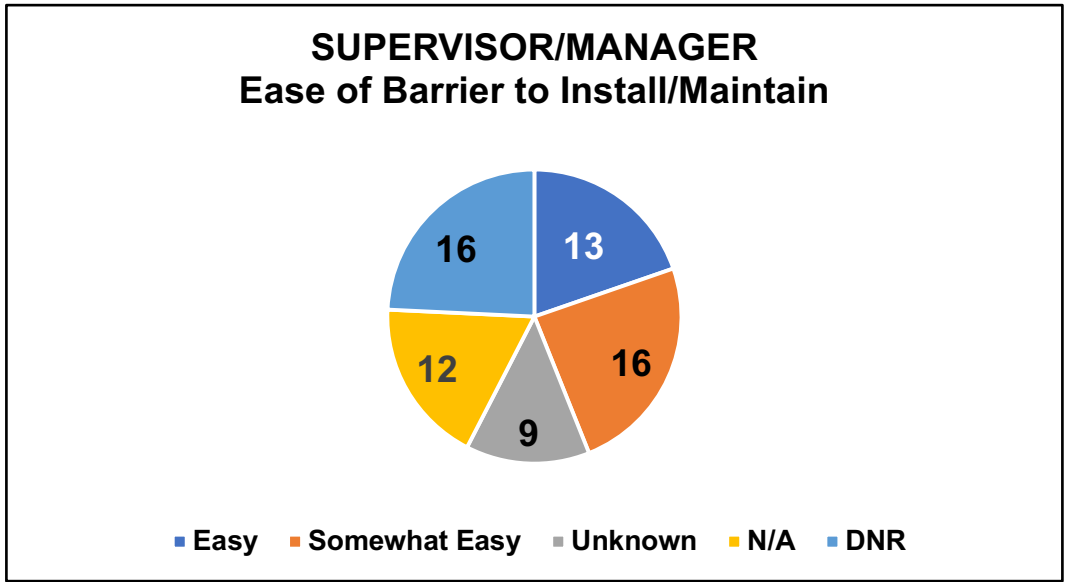

SUPERVISORS / MANAGERS
Was Barrier Training Provided
32
22
11
1
3
Yes
No
DNR
N/A
Unknown

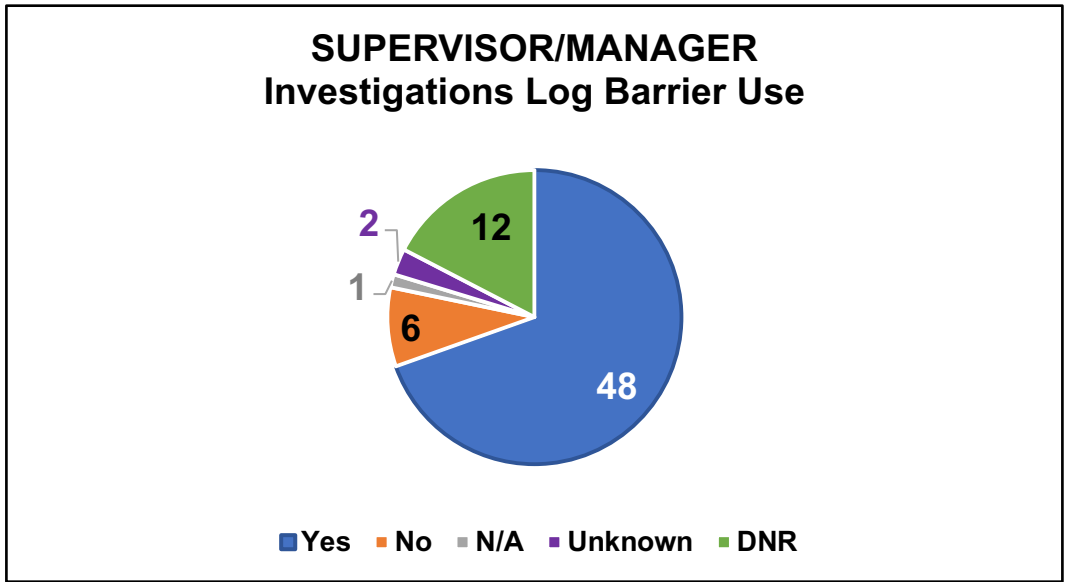

SUPERVISOR/MANAGER
De-Escalation Training Provided
39
16
3
10
1
Yes
No
N/A
DNR
Unknown

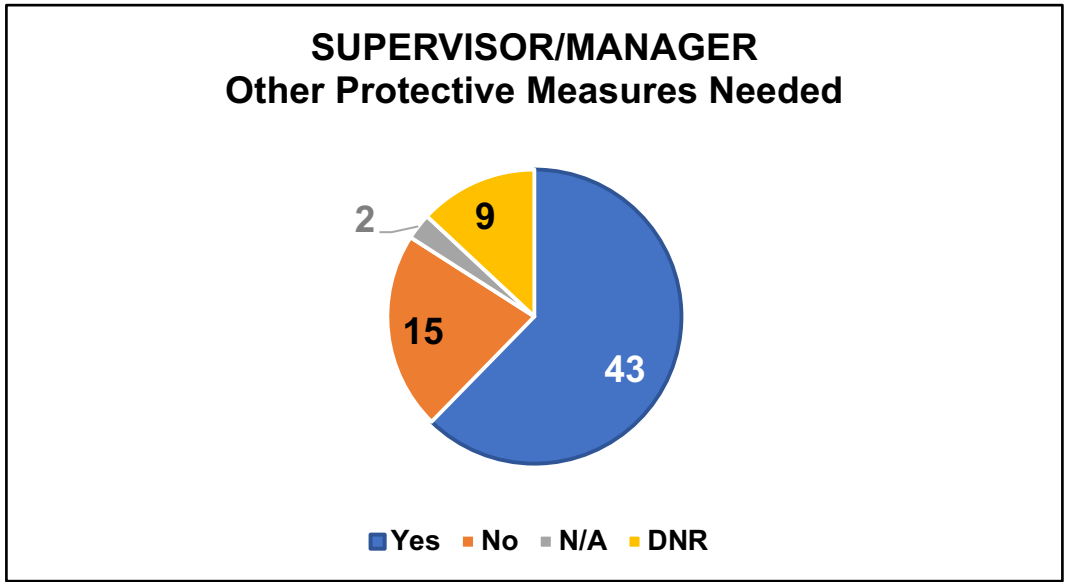

SUPERVISORS / MANAGERS
Barrier Training Effectiveness
24
17
12
10
4
Very Effective
Somewhat Effective
N/A
DNR
Unknown


Supervisors/Manager would
Mandatory Use Reduce Assaults
34
24
2
9
Yes
No
N/A
DNR


Supervisor/Manager
Track Use During Observations
22
33
6
8
Yes
No
N/A
DNR

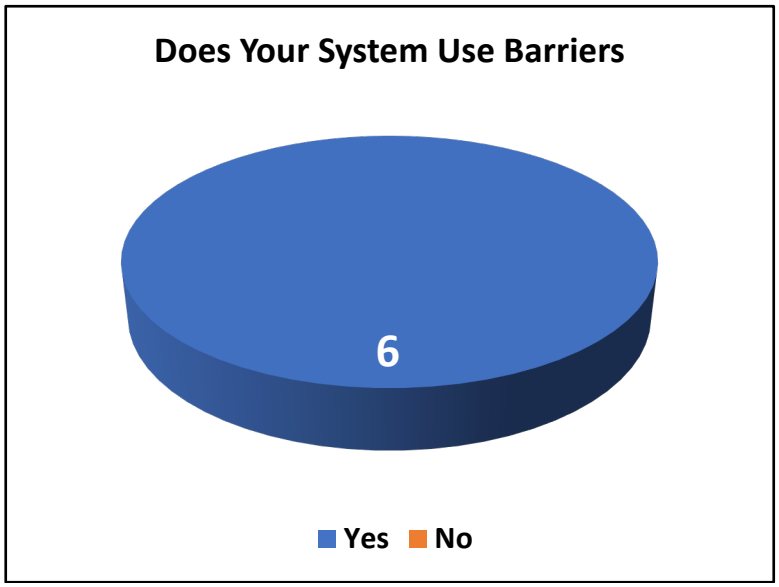

SUPERVISOR/MANAGER
Ease of Barrier to Install/Maintain
16
13
12
16
9
Easy
Somewhat Easy
Unknown
N/A
DNR

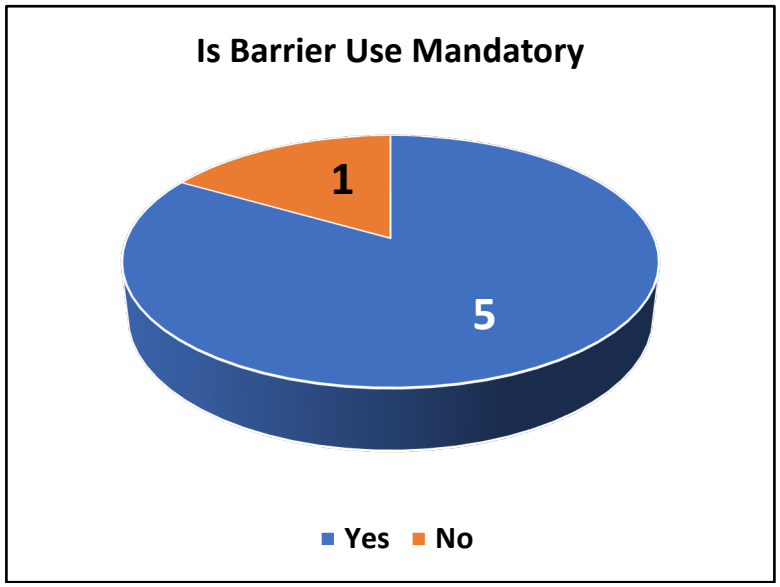

SUPERVISOR/MANAGER
Investigations Log Barrier Use
2
12
1
6
48
Yes
No
N/A
Unknown
DNR

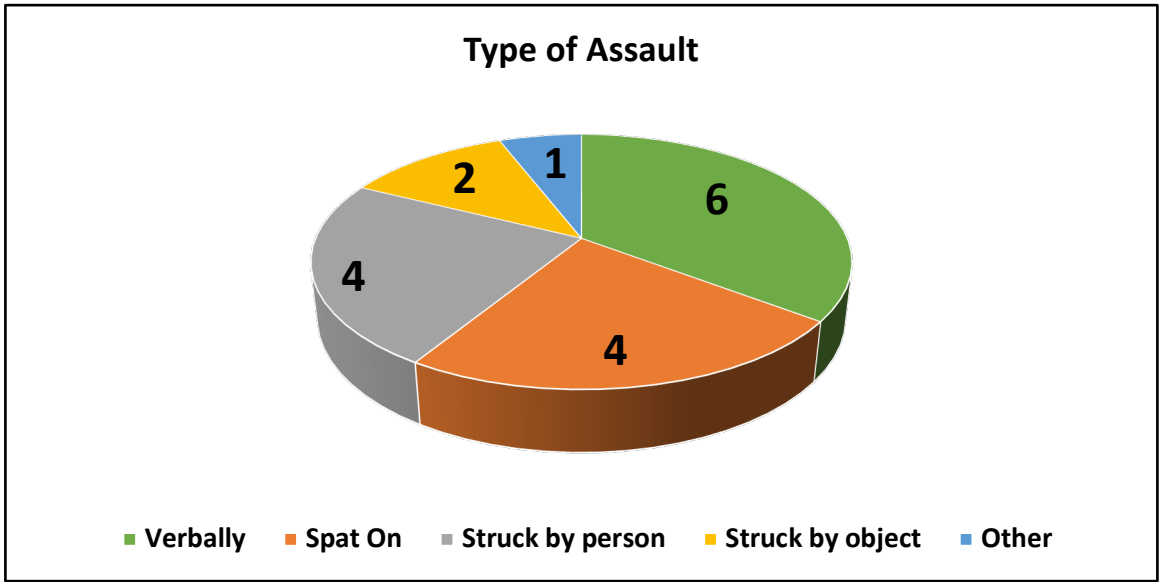

SUPERVISOR/MANAGER
Other Protective Measures Needed
2
9
15
43
Yes
No
N/A
DNR

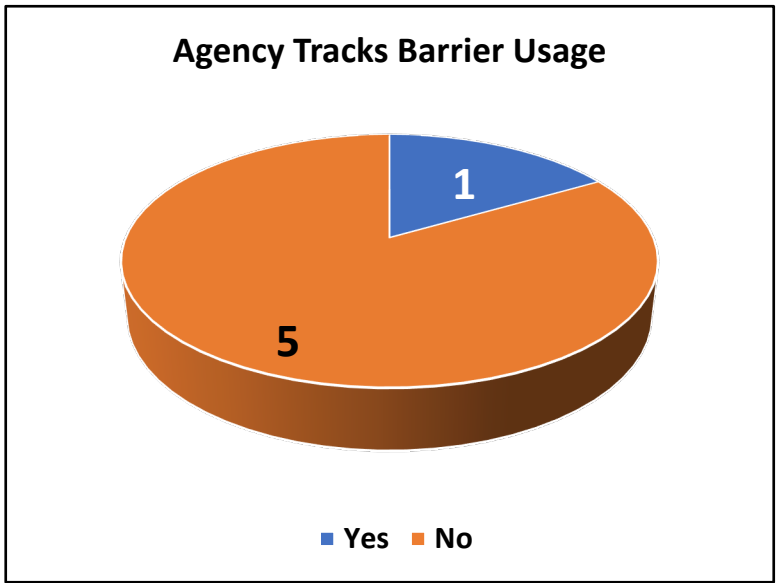
APPENDIX D – Industry Survey Analysis Charts and Graphs

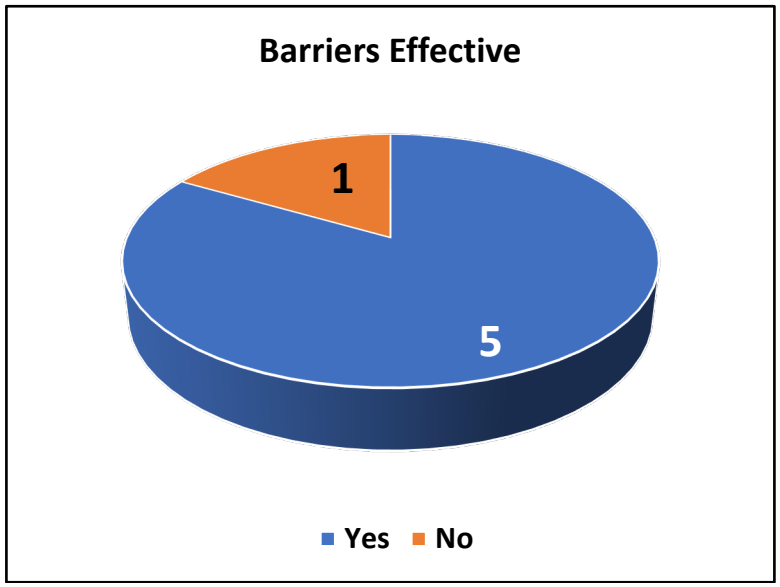
Appendix D contains the graphs and charts that were produced from analyzing the data provided in the industry surveys.

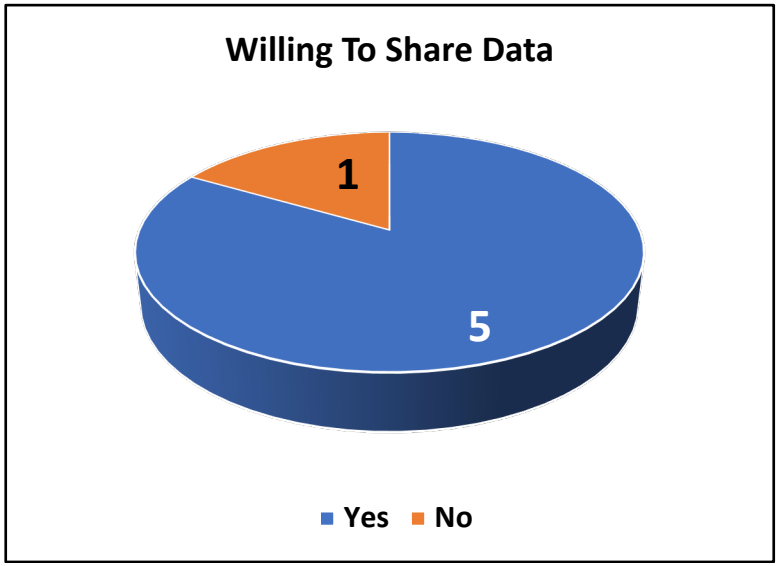


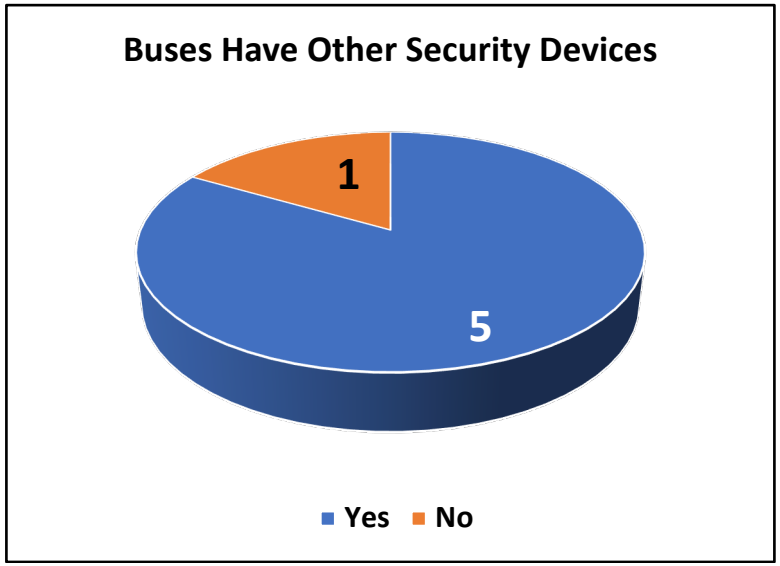


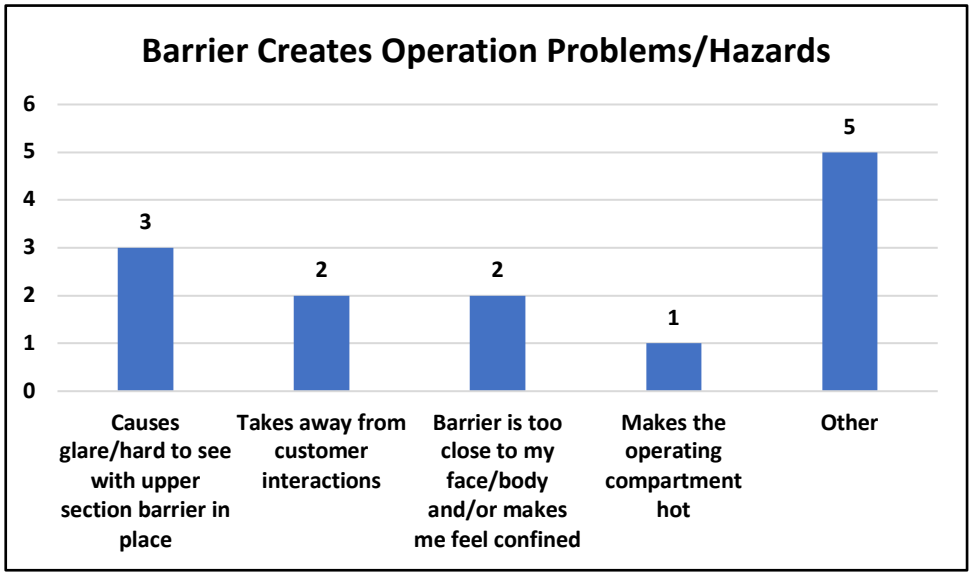

Type of Assault
1
2
6
4
4
Verbally
Spat On
Struck by person
Struck by object
Other


Agency Tracks Barrier Usage
1
5
Yes
No

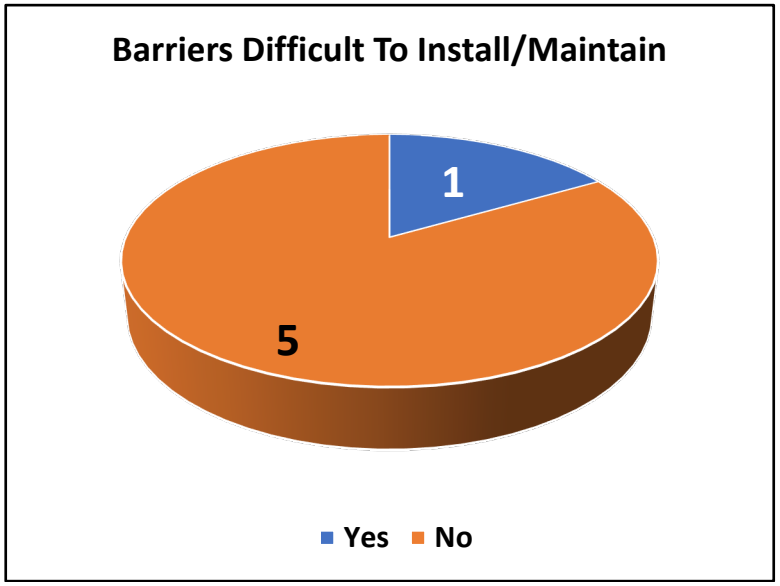

Barriers Effective
1
5
Yes
No

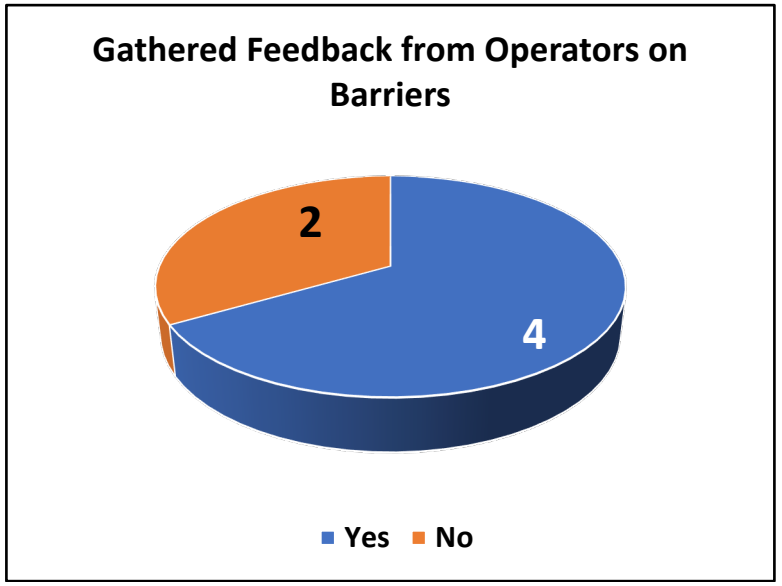


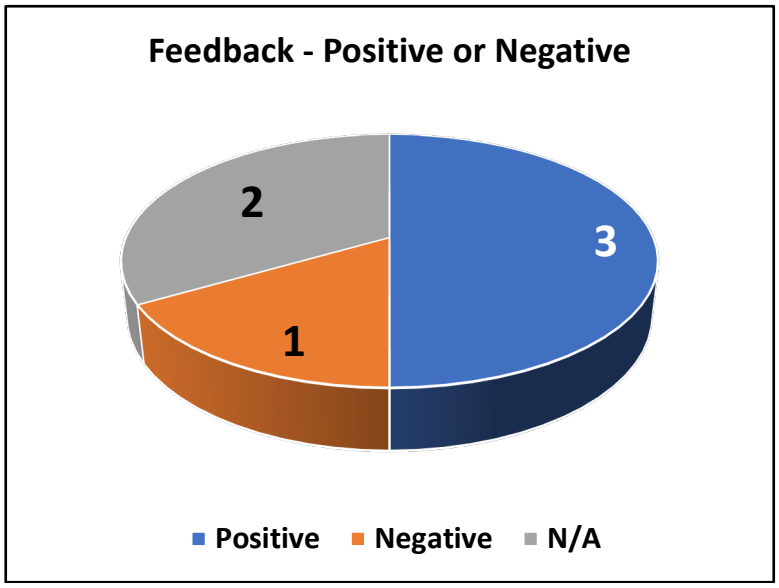


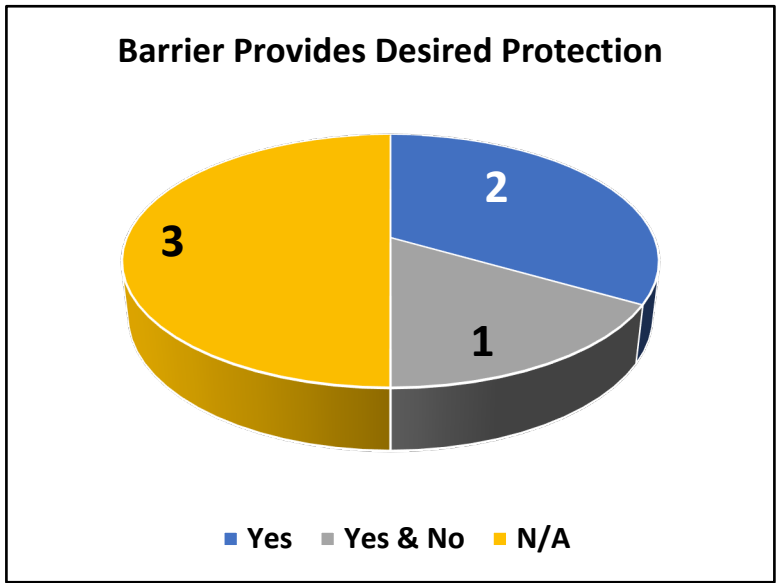


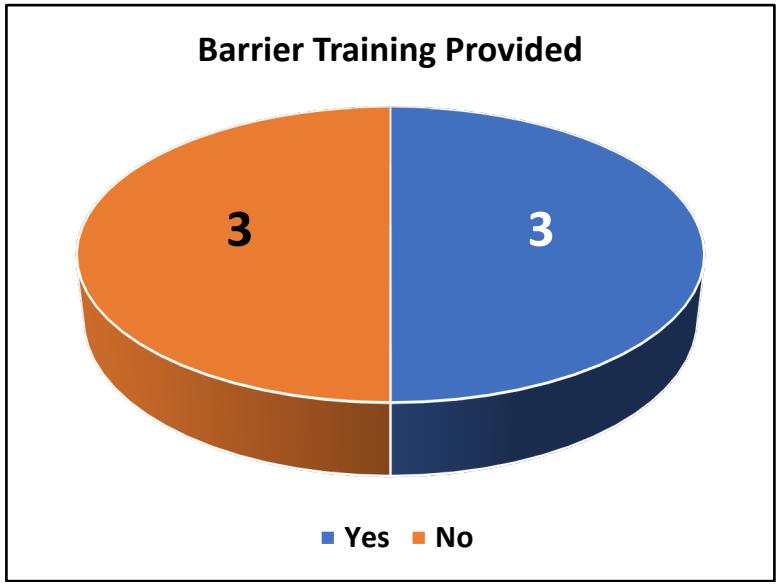
Agency	Other Operational Issues
MBTA	Due to the weight of the Safety Barrier there has been an increase in ankle injuries due to the barrier closing on operators' ankles. In addition, the latch on the door was stiff, which caused wrist injuries.
WMATA	Increased fumes due to restricted air flow in operator compartment
NYCTA	None of the above
TriMet	Some obstruction between operator and interior occupant mirror.
MDT	APTA Questionnaire provided instead of answering survey

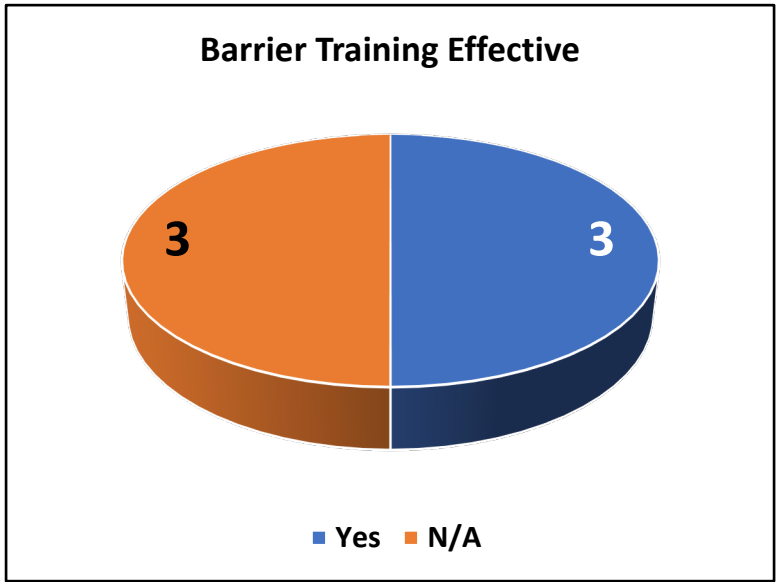

Barriers Difficult To Install/Maintain
1
5
Yes
No

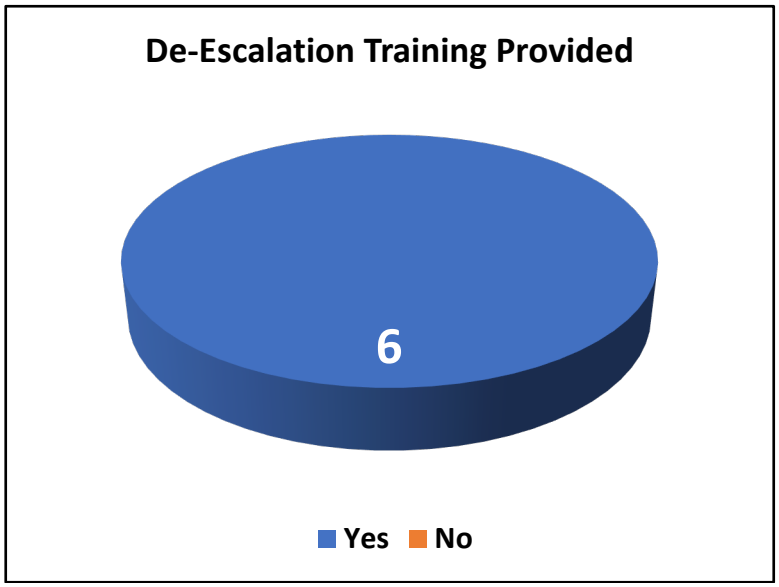

Gathered Feedback from Operators on Barriers
2
4
Yes
No


Feedback - Positive or Negative
2
3
1
Positive
Negative
N/A

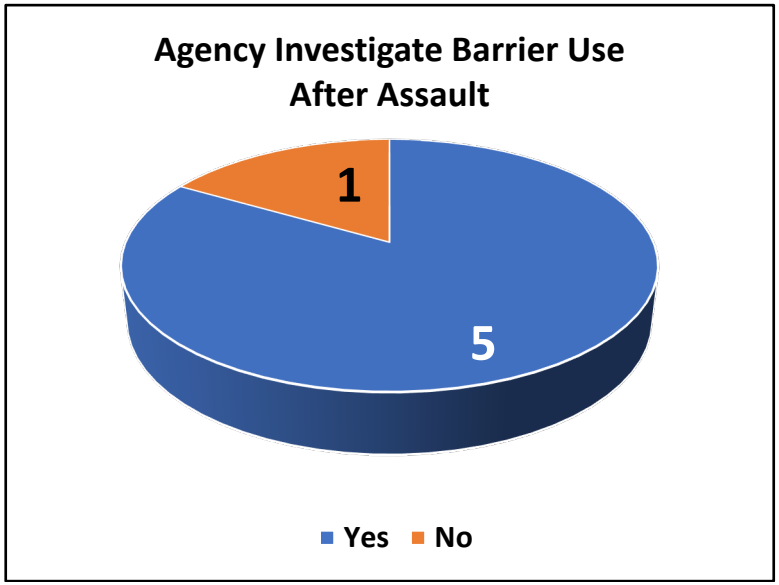

Barrier Provides Desired Protection
2
3
1
Yes
Yes & No
N/A

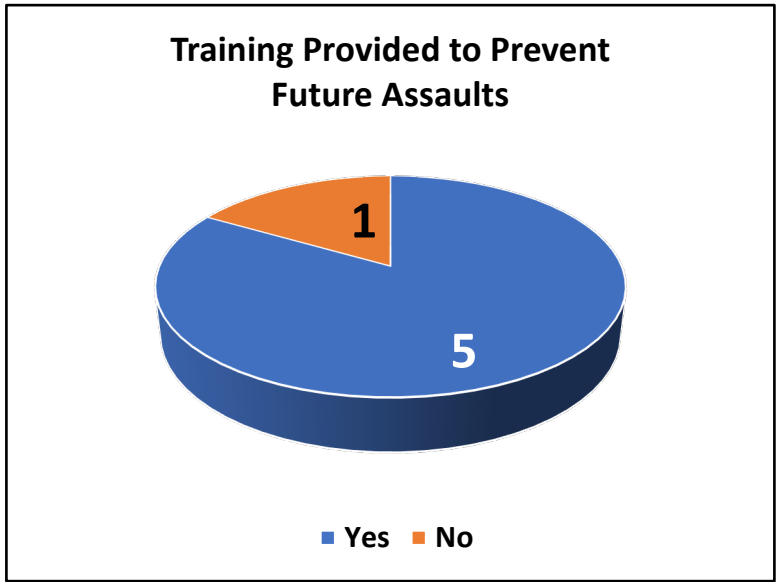

Barrier Training Provided
3
3
Yes
No

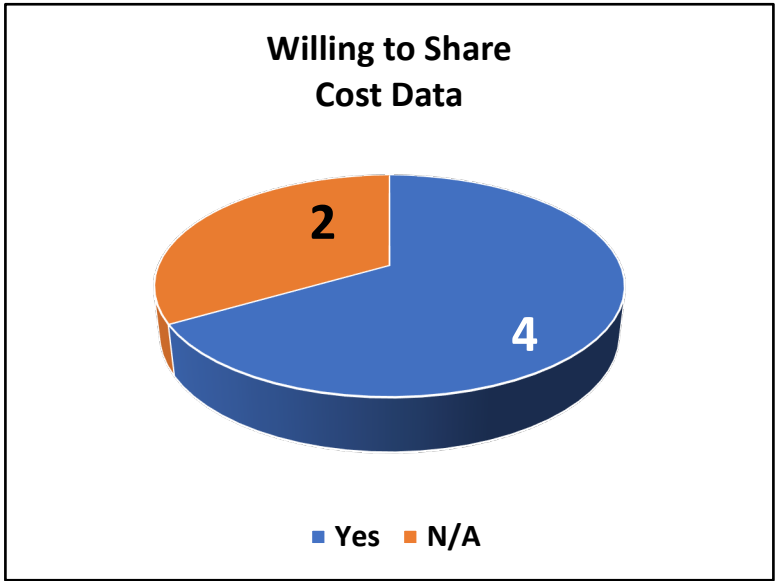

Barrier Training Effective
3
3
Yes
N/A


De-Escalation Training Provided
6
Yes
No


De-Escalation Training Effective
6
Yes
No


Agency Investigate Barrier Use After Assault
1
5
Yes
No


Training Provided to Prevent Future Assaults
1
5
Yes
No


Willing to Share Cost Data
2
4
Yes
N/A

APPENDIX E – Bus Operator Survey

The Metro Office of the Inspector General seeks your input to complete a study of the use and effectiveness of the Bus Operator Safety Barriers Systems currently used by Metro. Your participation in the below survey is voluntary and, if you choose, anonymous.

General Information:

Date: ___/___/2019 Badge (optional): _____

Division: _____ Line Numbers Driven: _____

( ) Full-Time ( ) Part-Time ( ) Daylight Hours ( ) Dark Hours

( ) Male ( ) Female

Age Group: 30 or Younger ( ) 31-40 ( ) 41-50 ( ) 51-60 ( ) 61 or Over ( )

Years of Experience: 0-1 ( ) 2-5 ( ) 6-10 ( ) 11-15 ( ) 16-20 ( )

21-25 ( ) 25-30 ( ) 31+ ( )

Survey:

1. Have you operated a bus with a Bus Operator Safety Barrier installed? ( ) Yes ( ) No
2. Did having the Safety Barrier on the bus make you feel more secure? ( ) Yes ( ) No
3. Did you use any part of the Safety Barrier while operating the bus? ( ) Yes ( ) No
4. If yes, what section(s) did you use?
   - ( ) Top Section Only
   - ( ) Bottom Section Only
   - ( ) Bottom and Top Sections
5. If you don't use the upper barrier, why not (Check all that apply)?

( ) Creates right side mirror issues for operating the bus.

( ) The barrier creaks or makes noise when used.

( ) Causes glare/hard to see with upper section barrier in place.

( ) Takes away from customer interactions.

( ) The barrier is too close to my face/body and/or makes me feel confined.

( ) Feel it does not increase my safety when operating.

( ) Makes the operating compartment hot.

( ) I don't feel I need this protection.

( ) Other, explain: _____

6. How would you characterize the Safety Barrier's ease of use?
   ( ) Easy
   ( ) Somewhat Easy
   ( ) Difficult
   ( ) Very Difficult

7. If difficult or very difficult, please explain why? _____

8. How effective in improving your safety do you believe the Safety Barriers are?
   ( ) Very Effective
   ( ) Somewhat Effective
   ( ) Ineffective
   ( ) Very Ineffective

9. If ineffective or very ineffective, please explain why? _____

10. Would addressing the issues you identified above increase your likelihood of you using the Safety Barriers? ( ) Yes ( ) No

11. If no, what other feature(s) are needed?_____

12. Do you use the barriers when operating certain lines and not others? ( ) Yes ( ) No

13. If yes, on what lines do you use the barriers the most? _____

14. Was training on the use of the Barriers provided prior to their installation? ( ) Yes ( ) No

15. In your opinion, how effective was the training?
   ( ) Very Effective
   ( ) Somewhat Effective
   ( ) Ineffective
   ( ) Very Ineffective

16. If ineffective or very ineffective, please explain why? _____

17. Has de-escalation training on how to handle potentially volatile situations, such as fare disputes, been provided? ( ) Yes ( ) No

18. In your opinion, how effective was the training?

( ) Very Effective

( ) Somewhat Effective

( ) Ineffective

( ) Very Ineffective

19. If ineffective or very ineffective, please explain why:_____

20. Would mandatory use, instead of optional / voluntary use of the Barriers reduce the number of assaults? ( ) Yes ( ) No

21. If no, why? _____

22. Have you ever been assaulted with the Safety Barriers in place? ( ) Yes ( ) No

23. If yes, what was the type of assault?

( ) Spit on

( ) Struck by a person

( ) Struck by object

( ) Verbally

( ) Other, explain: _____

24. Do you believe other protective measure should be implemented to prevent/reduce assaults? ( ) Yes ( ) No

25. If yes, what are they? _____

26. Is there any other information you would like to share regarding the Bus Operator Safety Barriers?__

APPENDIX F – Bus Supervisor/Manager Survey

The Metro Office of the Inspector General seeks your input to complete a study of the use and effectiveness of the Bus Operator Safety Barriers Systems currently used by Metro. Your participation in the below survey is voluntary and, if you choose, anonymous.

General Information:

Date: ___/___/2019 ( ) Supervisor ( ) Manager

Bus Base Location: _____ ( ) Male ( ) Female

Badge (optional): _____ Shift Worked: _____

Age Group: 30 or Younger ( ), 31-40 ( ), 41-50 ( ), 51-60 ( ), 61 or Over ( )

Years of Experience as Supervisor or Manager: 0-1 ( ), 2-5 ( ), 6-10 ( ), 11-15 ( ), 16-20 ( ), 21-25 ( ), 25-30 ( ) 31+ ( )

Survey:

1. Have you operated a bus with a Bus Operator Safety Barrier installed? ( ) Yes ( ) No
2. Did having the Safety Barrier on the bus make you feel more secure? ( ) Yes ( ) No
3. Did you use any part the Safety Barrier while operating the bus? ( ) Yes ( ) No
4. If yes, what section(s) did you use?
   - ( ) Top Section Only
   - ( ) Bottom Section Only
   - ( ) Bottom and Top Sections
5. If you don't use the upper barrier, why not (Check all that apply)?
   - ( ) Creates right side mirror issues for operating the bus.
   - ( ) The barrier creaks or makes noise when used.
   - ( ) Causes glare/hard to see with upper section barrier in place.
   - ( ) Takes away from customer interactions.
   - ( ) The barrier is too close to my face/body and/or makes me feel confined.
   - ( ) Feel it does not increase my safety when operating.
   - ( ) Makes the operating compartment hot.
   - ( ) I don't feel I need this protection.
   - ( ) Other, explain: _____

6. How would you characterize the Safety Barrier's ease of use?
   ( ) Easy
   ( ) Somewhat Easy
   ( ) Difficult
   ( ) Very Difficult

7. If difficult or very difficult, please explain why? _____

8. How effective do you believe the Safety Barriers are in protecting Bus Operators?
   ( ) Very Effective
   ( ) Somewhat Effective
   ( ) Ineffective
   ( ) Very Ineffective

9. If ineffective or very ineffective, please explain why? _____

10. Do you believe addressing the issues you identified above would increase the likelihood of Operators using the Safety Barriers? ( ) Yes ( ) No

11. If no, what other feature(s) are needed: _____

12. Has the installation of the Safety Barriers reduced the frequency and/or severity of assaults on Bus Operators? ( ) Yes ( ) No

13. Was training on the use of the Barriers provided prior to their installation? ( ) Yes ( ) No

14. In your opinion, how effective was the training?
   ( ) Very Effective
   ( ) Somewhat Effective
   ( ) Ineffective
   ( ) Very Ineffective

15. If ineffective or very ineffective, please explain why: _____

16. Has de-escalation training on how to handle potentially volatile situations, such as fare disputes, been provided? ( ) Yes ( ) No

17. How effective do you believe the training is?
   ( ) Very Effective
   ( ) Somewhat Effective
   ( ) Ineffective
   ( ) Very Ineffective

18. If ineffective or very ineffective, please explain why: _____

19. Would mandatory use, instead of optional/voluntary use of the Barriers reduce the number of assaults on Operators? ( ) Yes ( ) No

20. If no, why?_____

21. Do you track the use of the barriers while making observations in the field? ( ) Yes ( ) No

22. If no, why? _____

23. Do investigations of assaults identify whether the Safety Barriers were in use when the assault took place? ( ) Yes ( ) No

24. How would you characterize how easy the Safety Barriers are to install and maintain?

- ( ) Easy
- ( ) Somewhat Easy
- ( ) Difficult
- ( ) Very Difficult

25. If difficult or very difficult to maintain, please explain why? _____

26. Is training provided to Operators following an assault to help prevent future assaults? ( ) Yes ( ) No

27. Do you believe other protective measure in addition to the Safety Barriers should be implemented to prevent/reduce assaults? ( ) Yes ( ) No

28. If yes, what are they? _____

29. Is there any other information you would like to share regarding the Bus Operator Safety Barriers?

_____

APPENDIX G – Industry Survey

Introduction

The Office of the Inspector General (OIG) of the Los Angeles County Metropolitan Transportation Authority (LA Metro) is completing a study to examine the use and effectiveness of Bus Operator Safety Barriers. The OIG seeks data from peer agencies as part of this study to determine the effectiveness of the barrier systems currently being used by LA Metro and to identify potential industry best practices that may be implemented by LA Metro. Your participation in the below survey is appreciated.

Survey:

1. Agency Name: _____
2. Contact Information: _____
3. How large is your bus fleet? _____
4. How many bus operators does your agency employ? _____
5. How many bus routes does your agency operate? _____
6. What is your annual bus ridership? _____
7. Does your system use Bus Operator Safety Barriers on its transit buses? ( ) Yes ( ) No
8. If yes, what is the make and model of the Safety Barriers? _____
9. If yes, what percentage of buses are equipped with Safety Barriers? _____
10. Is the use of the Safety Barriers by Bus Operators mandatory? ( ) Yes ( ) No
11. If no, why? _____
12. Does your agency track Bus Operator use of the Safety Barriers? ( ) Yes ( ) No
13. If yes, what percentage of Bus Operators use the Safety Barriers? _____
14. What are the most frequent types of assaults experienced by your Bus Operators?

( ) Spit on
( ) Struck by a person
( ) Struck by object thrown
( ) Verbal altercation
( ) Weapon
( ) Other, explain: _____

15. Have the Safety Barriers been effective in reducing the frequency and/or severity of assaults against Bus Operators? ( ) Yes ( ) No

16. If yes, how much have assaults been reduced?_____

17. If no, please explain:_____

18. Would you be willing to share your incident data with LA Metro? ( ) Yes ( ) No

19. To the best of your knowledge, has the use of the Safety Barriers caused operational problems / hazards for your Bus Operators (Check all that apply?

( ) Creates right side mirror issues for operating the bus.
( ) The barrier creaks or makes noise when used.
( ) Causes glare/hard to see with upper section barrier in place.
( ) Takes away from customer interactions.
( ) Barrier is too close to my face/body and/or makes you feel confined.
( ) Feel it does not increase my safety when operating.
( ) Makes the operating compartment hot.
( ) I don't feel I need this protection.
( ) Other, explain:_____

20. Are your buses equipped with any other security / protective systems designed to reduce the occurrence of assaults on Bus Operators? ( ) Yes ( ) No

21. If yes, what are they?_____

22. To your knowledge, are the Safety Barriers difficult to install or maintain? ( ) Yes ( ) No

23. If yes, why?_____

24. Has your agency gathered feedback from Bus Operators regarding the effectiveness of the Safety Barriers and their use? ( ) Yes ( ) No

25. If yes, has the feedback been positive or negative? ( ) Positive ( ) Negative

26. If negative, what are the Bus Operators most frequent complaints regarding the Safety Barriers?___

27. Does the design of the barrier provide the protection needed, whether Bus Operators choose to use the Safety Barrier or not? ( ) Yes ( ) No

28. If yes, has the training been effective? ( ) Yes ( ) No

29. Has de-escalation training on how to handle potentially volatile situations such as fare disputes been provided? ( ) Yes ( ) No

30. If yes, has the training been effective in helping Operators to deal with volatile situations: ( ) Yes ( ) No

31. Does your agency determine during its investigations of bus operator assaults whether or not the barriers were in place while the assault took place? ( ) Yes ( ) No

32. Is training provided to the Operator following an assault to help prevent future assaults? ( ) Yes ( ) No

33. What has been identified as being the most effective means of reducing assaults on operators at your agency?_____

34. Are the costs incurred to procure, install and maintain the Safety Barrier systems greater or less than those incurred as a result of assaults on bus operators?_____

35. Would your agency be willing to share its cost data related to the Bus Operator Safety Barriers? ( ) Yes ( ) No

36. Is there any other information you would like to share regarding your agency's use of the Bus Operator Safety Barriers?_____

APPENDIX H – Schedule of Recommendations

	Recommendations	Metro Response
1	**Continue Installation Program**	
	a. Metro should continue to install the bus operator safety barriers and onboard camera and monitor systems throughout its bus fleet and continue to monitor incident data to further verify the effectiveness of both systems in preventing assaults on bus operators.	
2	**Standardize and Enhance Data Collection Methods**	
	a. Metro should ensure data collection is standardized by Metro and all transit security providers and investigators to consistently identify the types of assaults that have occurred, if the bus was equipped with a safety barrier, if the barrier was in use at the time of the assault, and if in use, how it was being used (i.e., top portion only, bottom portion only, or both portions). Standardizing the data in this manner will result in more accurate and consistent data that can be more easily analyzed to identify trends and to measure performance. b. Metro should ensure data is collected on the type and extent of injuries incurred by bus operators when the safety barriers are in use. This will further aid in determining the effectiveness of the safety barriers (i.e., if bus operator injuries are lessened as a result of the barriers being used) and if design changes or modifications are necessary.	
3	**Utilize Data Analysis to Set Policing Strategy**	
	a. Metro should ensure that assault trend analysis results are used to review current policing and fare enforcement strategies to determine if law enforcement, Supervisors, and fare enforcement personnel and strategies are being appropriately deployed toward the routes and times of day in most need of a Police, Supervisory, or fare enforcement presence.	
4	**Issue Mandatory Usage Policy**	
	a. Although the safety barriers may present operational hazards such as glare, Metro should make the use of the barriers mandatory until Metro can determine if their use contributes to or causes accidents or increases accident frequency. Mandatory use of the barriers is the best way to evaluate their true effectiveness in reducing assaults on bus operators. b. If the use of the barriers is made mandatory, Metro should collect data to substantiate and study the issues identified by operators as to why they do not use the barriers. Metro can then take corrective action, such as design changes and modifications to the barriers, if accident/incident data substantiate operator concerns.	

	Recommendations	Metro Response
5	**Establish Communication Channels for Follow Up and Discussion of Bus Barrier Issues**	
	a. Metro should further study why bus operators feel the bus safety barriers do not provide the protection needed to make them feel more secure and the other measures bus operators would like to see implemented. b. Evaluate the current design of the safety barriers to determine if bus operators' concerns can be addressed through design changes and modifications made to the safety barriers. c. Create a committee comprised of bus operators, Supervisors and Managers, Safety Department, and Bus Operations and Bus Maintenance personnel to investigate these issues and to determine appropriate mitigations. The focus of the committee should include an effort to increase barrier use, identify ways to make the barriers more effective, and evaluate training, and improve data collection and accuracy. Metro could also consider utilizing an existing committee to take on this action, if one has already been established for investigating possible safety issues with systems and equipment.	
6	**Expand Scope of Training**	
	a. Metro should review safety barrier and de-escalation training to evaluate scope of attendees, frequency, content, method of delivery, consistency of delivery, and employee engagement and understanding. Results from these evaluations should be used to modify training programs as necessary. b. Consider adding both training classes as part of the new hire training course and periodic refresher training for current operators along with any other ongoing training requirements.	
7	**Continue Strengthening Preventative Measures to Combat Operator Assaults**	
	a. Metro should continue to follow its current strategies and implement its current programs to prevent assaults on bus operators. These programs are consistent with industry best practices. b. Consider using some of the evaluation tools developed by TCRP to identify in more detail where its greatest risks reside and employ tactics such as targeted fare enforcement and policing patrols to address problem areas using existing resources.	