**The Miami Real-Time Crime Center (MRTCC) Violence Response Initiative:
An Embedded Police-Academic Partnership**

Final Report

Smart Policing Initiative (SPI)

Bureau of Justice Assistance, U.S. Department of Justice

September 26, 2022

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Disclosures

Suggested citation:

Guerette, Rob T., Kimberly Przeszlowski, Jose Rodriquez, Jaime Ramirez, and Alejandro Gutierrez, and Joelle Lee-Silcox (2022). "The Miami Real-Time Crime Center (MRTCC) Violence Response Initiative: An Embedded Police-Academic Partnership." Final report submitted to the Bureau of Justice Assistance, U.S. Department of Justice, Smart Policing Initiative.

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Executive Summary

Targeted Problem

The primary focus of the Miami Real-Time Crime Center (MRTCC) violence response initiative was to improve responses to violent crime incidents with the development of a formidable, centralized platform within the Miami Police Department (MPD) to harness and deploy a host of information technologies to officers, detectives, and Neighborhood Enhancement Team (NET) commanders in real-time. An additional objective of the project was to understand how officers perceived the role of these technologies, assess the extent to which MRTCC technologies were used in the processing of violent crime incidents, and determine the impact of MRTCC technologies on violent crime case clearances and the time it took to clear those cases. The SPI grant awarded to achieve these objectives was subsequent to a previous SPI grant which had developed the crime analysis capacity within the department. That initiative served as the segue for launching, developing, and evaluating the Miami Real-Time Crime Center to further the use of information technologies in operational decision-making. The use of data and information to inform policing operations had historically been limited within the department.

Strategies Employed

The two project objectives were facilitated through a collaboration between researchers from Florida International University and the Miami Police Department. The research team was comprised of one criminology faculty member and a doctoral student, the latter who was embedded within the MRTCC and worked alongside MRTCC detectives and analysts. The MPD command staff in charge of the MRTCC launched and developed the MRTCC over the three-year project term and worked closely with the research team in facilitating data collection activities. In addition to the outcome evaluation, the research team conducted a survey of existing RTCCs within other police agencies nationally which was used in the initial development of the MRTCC.

Analysis & Evaluation

By the close of the project term, the MRTCC unit was positioned to operate nearly 582 cameras, with the capability to access a wide assortment of information technology resources, operated with 9 full-time personnel, and provided coverage for 86 percent of weekly hours. During the three-year project term, the MRTCC unit provided support to 648 violent crime incidents. A three-part multi-method evaluation of the MRTCC initiative entailed 1) a disproportionate stratified random survey of MRTCC users, 2) a module network analysis of MRTCC-assisted case components, and 3) a quasi-experiment with relevant controls to determine the impact of the MRTCC on case clearance and the time to clearance. The MRTCC was perceived as providing multiple benefits in the ability to respond to violent crime incidents, had become firmly integrated into case processing, and effectively increased the ability to clear cases.

Specific key findings from those three evaluation components include the following:

1. *Users of the MRTCC technologies widely perceived them to be easily accessible, useful, and to have become integral to their work.*

   - Nearly half of all respondents (48%) indicated that information was received within minutes of requesting it and that when MRTCC detectives were on duty they are always accessible. Another 20 percent of respondents (n = 9) indicated that they regularly receive information within an hour or two.
   - Ninety-three percent of respondents (n = 43) either strongly agreed or agreed with the statement that the establishment of the MRTCC had improved their ability to perform their duties.
   - Seventy percent of respondents reported that they utilized the technologies housed within the MRTCC on either a daily or weekly basis and it had become "standard operating procedure."

2. *Most respondents believed that MRTCC technologies had improved the identification and documentation of evidence, improved the ability to clear cases, and reduced the time to clear cases.*

   - Ninety-one percent (n = 42) agreed or strongly agreed with the statement that MRTCC technologies had improved their ability to develop investigative leads.
   - Ninety-three percent (n = 43) strongly agreed or agreed that the MRTCC technologies had improved their ability to gather evidence in support of their work responding to and investigating violent crime incidents.
   - Seventy-six percent of respondents (n = 35) either strongly agreed or agreed that the MRTCC technologies had improved case clearances.
   - Seventy-eight percent of respondents (n =36) either strongly agreed or agreed with the statement that MRTCC technologies had shortened the amount of time that it took to clear cases.

3. *Users most consistently conveyed that the MRTCC platform could be improved by expanding the technologies, particularly CCTV, to cover more operational areas 24 hours a day, and by allowing direct use of some technologies by detectives and commanders.*

   - Fifty percent of the responses to a question asking the ways the MRTCC could be improved were by adding more information sources, namely CCTV, and by increasing the direct accessibility of the technologies within the unit.

4. *The use of MRTCC technologies has become fully integrated into the processing of cases, is used in conjunction with, and has achieved the same level of importance as other traditional evidence sources.*

- The module network analysis of MRTCC-assisted cases empirically validated the survey findings that the use of MRTCC technologies had become integrated into case processing. That analysis revealed that MRTCC technologies were being used in conjunction with other traditional varieties of evidence such as human-based evidence, crime scene evidence, and warrant-based evidence. They were also equally related to those other forms of evidence, and they had similar and, in some cases, greater roles in the processing of cases.

- Three of the MRTCC evidence sources, CCTV, social media, and facial recognition, had moderate to high "betweenness" centrality measures comparable to the other traditional evidential nodes within the network. Additionally, several of the MRTCC evidence nodes (CCTV, facial recognition, and social media) had consistently moderate to high measures of degree centrality and closeness centrality.

- The added value of this level of integration of MRTCC technologies is that it substantially improves the ability of officers and detectives to triangulate information across multiple evidence sources which should improve the strength and validity of cases.

5. *The use of MRTCC technologies has significantly improved the ability to clear violent crime cases but has not shortened the amount of time to clear cases.*

- In the quasi-experiment that compared MRTCC-assisted case clearances with those of a stratified randomly drawn control sample, it was found that MRTCC-assisted cases had significantly greater odds of being cleared compared to similar cases without MRTCC support. After controlling for the neighborhood, crime type, and case-level characteristics, the MRTCC-assisted cases had 66 percent better odds of being cleared compared to those cases not receiving MRTCC support.

- This was an additional improvement from estimates that adjusted solely for the neighborhood, crime type, and victim characteristics, where the odds of a violent crime case being cleared were still 39 percent better for MRTCC-assisted cases compared to control cases.

- The use of MRTCC technologies did not shorten the amount of time taken to clear cases. MRTCC-assisted cases had an average of 44 days to clearance compared to the control sample with an average of 19 days. A Kaplan Meier survival analysis which plots the trend lines of clearances across time also revealed that MRTCC cases took significantly more days to clear cases compared to the control sample. However, after adjusting for case characteristics in a Cox Proportional Hazards regression model, no significant differences in the time to case clearance were found between the two samples. Thus, while the use of MRTCC technologies did not reduce the time-to-clearance, once case-level circumstances were considered, the use of MRTCC technologies did not prolong the time that it took to clear cases either.

Lessons Learned and Recommendations

Through the development and ongoing operation of the MRTCC, several lessons were learned by unit administrators. These included utilizing personnel within the unit, setting boundaries, positioning the unit for future development, and maintaining the unit as it progresses.

1. *It is important to clearly define roles for staff within the unit, do not repurpose individuals.* An RTCC chain of command should establish clear and delineated roles for those employed within the unit. Repurposing personnel to perform multiple tasks is inefficient, causes additional administrative burdens, and may not be cost-effective.

2. *Set boundaries on the functions that the RTCC will perform. Avoid "mission creep."* As an RTCC grows, it may find that some duties and responsibilities which previously fell under another unit will start to creep into the responsibility of the RTCC. It is important to not outreach the RTCC unit's capacity. It is also crucial to ensure users of RTCC services follow and respect an established evidence request system.

3. *Create the RTCC unit with anticipation for growth.* When developing an RTCC ensure that future growth is calculated into the equation. Adding new technologies will also require ancillary growth in the unit. To accommodate the inevitable need to maintain secure evidence storage consider acquiring a cloud-based storage system at the outset. Finally, when adding new technologies, be sure it meets the needs of your network.

4. *Continually maintain the RTCC as it grows.* From the initial development of the RTCC, it is important to establish standard operating procedures, document everything as it occurs, and build ongoing training for RTCC personnel as new technologies are acquired. Without this, workflows can become disorganized and inefficient and the potential for confidential information to be inappropriately disclosed will be increased. Documentation is critical for justifying budgetary increases and evaluation. Ongoing training will ensure unit consistency and efficiency.

Targeted Problem

Purpose and objectives of the MRTCC project

The primary objective of the Miami Real-Time Crime Center (MRTCC) Violence Response initiative was to improve responses to violent crime incidents with the development and delivery of a functioning centralized platform of information technologies that could deploy a wide variety of informational resources to patrol officers, detectives, and police commanders in a real-time format. An additional objective of the project was to understand how officers perceived the role of these technologies, assess the extent to which MRTCC technologies were used in the processing of violent crime incidents, and determine the impact of MRTCC technologies on violent crime case clearances and the time it took to clear those cases. These objectives were facilitated by partnering with criminologists from Florida International University (FIU), which consisted of one faculty member and one doctoral student who worked embedded within the MRTCC unit.

The launch of the Miami Real-Time Crime Center project was preceded by a previous SPI project with the same research partners that was devoted to developing the internal crime analysis capabilities of the department to better deploy usable information to MPD personnel which could be used to inform operational decision making (Guerette et al., 2019). Having achieved that capability, the MPD turned its attention to facilitating rapid delivery of information to officers in the form of a real-time crime center. The previously developed foundation served as a natural segue for the launch, development, and evaluation of the MRTCC violence response initiative.

Overview and development of RTCCs nationally

The trend of optimizing innovative technologies to improve the delivery of police services has gained considerable traction across law enforcement agencies. The primary driving force of

this development is the idea that actionable intelligence can be delivered to all levels of police personnel in a manner that has never been observed in the history of American policing (Randol, 2014). One outgrowth of this is the coordination of human resources with cyber-based information systems in the form of "real-time crime centers" (RTCCs) nationally. This newfound ability to harness and deploy robust cyber-based information to officers is believed to improve commonly desired investigative outcomes such as improved response times, clearance rates, officer safety, and use of force incidents (Coppola, 2016; Fox, 2014).

Despite lacking a clear conceptual framework, RTCCs are generally described as centralized data platforms that operate with the primary function of synthesizing and delivering robust intelligence information to officers in rapid timeframes. Individuals staffed within RTCCs have the capacity to actively monitor critical infrastructure and assets, produce post-incident investigative evidence, and facilitate collaboration across both internal units and external agencies. The turnaround time (i.e., from incident to evidence) and the quality of information that is offered to officers, detectives, and external partners has positioned these units as perceived invaluable resources for crime control and investigative purposes.

Creating an RTCC is often contingent on two main factors. That is the extent of technological proficiency exhibited by a police agency and the availability of resources. This is in addition to external dynamics, such as the nature of crime within the jurisdiction, citizen or stakeholder investment, and a host of other considerations that may play a role in the degree to which information can be used and managed. The recent diffusion of these centers suggests that a continuous demand exists across law enforcement agencies to manage the economics of policing

while simultaneously developing improved abilities to respond to crime and disorder within communities (Wuschke et al., 2018).

Notwithstanding their continued and increasing deployment nationally, the integration of these units within police operations remains a new and largely understudied phenomenon. To date, the Chicago Police Department's district-level Strategic Decision Support Centers (SDSCs) serve as the first and only evaluation of an RTCC in the country (Hollywood, McKay, Woods, & Agniel, 2019). To contribute to the scant body of literature devoted to understanding the nature and diffusion of these centers, and as part of the first phase of the MRTCC initiative, a nationwide appraisal of real-time crime centers (or their equivalent) was carried out in the form of a national survey of local police agencies housing these units (Przeszlowski et al., 2022).

The national study revealed four primary findings. First, RTCCs follow a common pattern of diffusion that has been observed in the implementation of preceding police practices and are currently in an early innovation/adoption phase, with only .3 percent of all police agencies and just 4 percent of large agencies nationally having adopted them. Second, RTCCs vary in how they operate and are structured across police agencies. Thus, there is no singular model for implementing and launching an RTCC. Third, a wide range of technologies and information sources are typically procured within these units, implying that the implementation of RTCCs may benefit from a clear strategic plan to help identify the purpose and function of each individual asset (Strom, 2017). Lastly, most agencies allow for actionable information to be shared with their local and federal partners in real-time, highlighting their vital position within police practices of working efficiently with the community and governmental partners. These findings were used to guide the development of the Miami RTCC.

Community Outreach and Collaboration

The MRTCC project was carried out through a collaboration between the Miami Police Department and Florida International University (FIU), South Florida's public research university. The university research team consisted of a faculty member with expertise in problem-oriented policing, situational crime prevention, crime analysis, and program and policy evaluation. It also included a doctoral student from the FIU Department of Criminology & Criminal Justice, International Crime & Justice Doctoral program. The doctoral student worked embedded within the Real-Time Crime Center unit at the Police Department in lieu of the research responsibility to the university. The student was assigned to the Police Department for 20 hours per week with biweekly meetings with the faculty member. The doctoral student was provided a desk and computer to work side-by-side with MRTCC detectives and crime analysts.

The role of the research partner was four-fold: 1) to support the development of the MRTCC, 2) to create and maintain a daily incident log of MRTCC-assisted cases, 3) to assess the use of the MRTCC by MPD personnel, and 4) to evaluate the impact of the MRTCC on violent crime cases outcomes. Within this, the research team conducted a national survey of existing RTCCs at other police agencies to inform the development of the MRTCC and facilitated the training of analysts and researchers in social network analysis by a nationally recognized expert. The MPD management team provided critical guidance and support for the research team and assisted in arranging meetings with other internal units as necessary. The MPD team also provided comments on the survey questions used in the national survey and provided feedback to the researchers on the survey used internally to assess the use of the MRTCC by MPD personnel. Finally, the MRTCC analysts were instrumental in maintaining the MRTCC incident log and

offered insight to researchers during several sit-in "real-time" observations of the MRTCC during their work.

In addition to the police–academic partnership, during the development of the MRTCC, several other community partnerships were formed within the MRTCC unit. One of these included an ongoing partnership with the City's waste management unit which provided CCTV cameras to be linked to the MRTCC command unit and the deployment of a waste management officer who sat in the MRTCC unit to monitor the cameras for illegal dumping activity. Additionally, several Business Improvement Districts (BIDs) and neighborhood management areas also provided CCTV cameras to the MPD for them to utilize within the MRTCC command unit to monitor and assess for crime and disorder problems within their respective neighborhood areas and business districts.

Strategies Employed

The launch, development, and evaluation of a functioning centralized cyber-based information platform involved several strategies. The first entailed an initial appraisal of real-time crime centers nationally, which ultimately guided the integration and use of the Miami RTCC within department-wide operations (refer to the intermediary report submitted to BJA).[2] The second strategy involved the creation of a sustainable MRTCC data log kept and maintained by the unit detectives. The log quantified the type of activities performed by the detectives within the unit and served as an important component in developing the extended analytical data logs constructed by the research team for further assessment. The third strategy involved routine observational sit-ins by members of the research team to objectively document the processes of the MRTCC operations. After its launch, the MRTCC sequentially acquired new technologies, added additional personnel, and extended coverage times. A chronological sequence of these major milestones achieved by the unit was documented (see Table 1), along with the formation of a logic model which outlines the main components and their relationships (see Figure 1), as well as the MRTCC unit standard operating procedures (SOP). Cumulatively, these parts facilitated the implementation, management, and eventual evaluation of the Miami RTCC.

<u>Internal Development</u>

Pre-MRTCC

The Miami Police Department unveiled its high-tech central command post, known as the Virtual Policing Unit (VPU) in 2015. The unit operated within the Office of Emergency Management and Homeland Security (OEM/HS), which was overseen by the Administrative

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[2] Guerette, R., Przeszlowski, K., Rodriguez, J., Ramirez, J., Gutierrez, A., & Lee-Silcox, J. (2021). *A National Appraisal of Real Time Crime Centers in the United States* (Grant No. 2019-WY-BX-0005). Bureau of Justice Assistance, U.S. Department of Justice.

Division. A total of thirty-two CCTV cameras were installed and twelve mobile license plate reader kits were deployed throughout the city within the first year of launch. The VPU was manned on an as-needed or per-request basis and predominantly acted as a command center during large-scale events. No standard operating procedures were developed. The intent was to grow the VPU, specifically as it concerned saturating the city with CCTV coverage and transitioning this into a regularly functioning real-time crime center.

MRTCC launch

Effective on April 28th, 2019, Miami launched its RTCC under the Investigative Support Section, an element of the Criminal Investigations Division. The primary objective of the unit was to oversee CCTV, license plate readers, and the gun-shot detection system. The vision of the unit was to provide real-time actionable investigative intelligence, thereby enhancing situational awareness and creating a virtual arrival scenario for officers responding to priority calls and developing situations.

Within the first year, the MRTCC obtained the current SPI grant to augment equipment and improve the use of data and information systems. Upon launch, the unit housed 187 CCTV cameras, deployed an additional six LPR vehicle kits, and acquired five mobile camera trailers. The hours for the MRTCC were set from 0600-1600 Monday through Friday. The center did not operate outside these hours, nor on the weekend. The forthcoming MRTCC timeline showcases the evolutionary trajectory of the MRTCC from an investigative tool into a real-time situational awareness platform.

Timeline of the Miami RTCC

The chronological sequence of major milestones achieved by the Miami RTCC serves multiple purposes (see Table 1). Internally, the evolutionary timeline showcases the major

accomplishments achieved by the MRTCC to executives and builds the case for additional resources (i.e., more personnel, new technologies). It depicts the progression of the unit over the course of its development and highlights the expansion of operations. Externally, the timeline serves as a guideline for agencies considering implementing and launching a unit of their own.

As depicted in Table 1, in the first year of the MRTCC launch emphasis was placed on the absorption of adequate infrastructure to support daily operations. As a result of internal buy-in and anecdotal success, year two involved the acquisition of additional information technologies and manpower to fulfill requests. The MRTCC expanded its hours of operation to support the increased demand. Year three proved to be a time of proactive undertakings. In anticipation of the expansion and advancement of the unit, a cloud-based evidence management system was sought out with the inclusion of an intelligence ecosystem capable of synthesizing the various technologies already acquired. Hours of operation were extended to cover twenty-one hours per day, seven days a week due to increased reliance and the evidentiary value of the intelligence provided by the unit.

In its current phase of development, the MRTCC is working toward creating an in-unit analyst position to aid detectives in monitoring the CAD-based information systems. Despite accessing similar data systems, this position will vary considerably from a traditional crime analyst position due to the temporal nature of the information provided. Moreover, an additional MRTCC Sergeant position has been proposed to alleviate the workload of the current Sergeant tasked with overseeing all MRTCC operations. The individual selected for this position will cover B-Shift and most of the C-Shift hours set by the agency.

Table 1. Timeline of the Miami Real Time Crime Center Development

Time Period	Major Milestones

Year One
April 2019 – March 2020
	MRTCC Launch
	    ○ Effective on April 28th, 2019, Miami launches their MRTCC.
	Hours of Operation
	    ○ The hours for the MRTCC are set from 0600-1600 Monday through Friday.
	Computer-aided Dispatch
	• CAD-developed information systems and databases are integrated within the unit.
	Video Management System
	• MRTCC transitions to a new video management system called Milestone.
	
	324 Cameras; 7 Personnel; 30% of weekly hours covered

Year Two April 2020 – March 2021	*Hours of Operations* • The hours of operation are extended to 2300, with the inclusion of weekends. *Crime Stoppers* • Crime Stoppers transitions from the Public Information Office to be handled by the MRTCC. *Facial Recognition* • MOU is signed with Clearview AI, a facial recognition software. *Commander Live Footage Access* • Net Commanders are given direct access to observe live CCTV footage. *BriefCam* • MOU is signed with BriefCam, an industry leader in video analytics. *Department of Transportation* • The MRTCC partners with Florida Department of Transportation to allow for additional live-access feeds. *Dataminr AI* • MOU signed with the provider of First Alert software. **435 Cameras; 9 Personnel; 71% of weekly hours covered**
Year Three April 2021-March 2022	*Hours of Operations* • The hours of operation are extended to 0300. *Standard Operating Procedures* • *SOP for the MRTCC is signed into effect.* *Emergency Response Platform* • RapidSOS is integrated to provide geo-locations on citizens who require emergency police assistance. *Cloud-based Evidence Storage* • The MRTCC acquires DigitalOnQ, a cloud-based evidence management system. *FususOne* • MOU is signed with Fusus, an open ecosystem that integrates MRTCC investigative technologies and assets. **537 Cameras; 9 Personnel; 86% of weekly hours covered**
Year Four Forthcoming	*MRTCC Analyst Position* • The unit works toward creating a MRTCC Analyst position to aid detectives in monitoring the CAD-based information systems. *Additional MRTCC Sergeant Position* • The unit works toward creating an MRTCC Sergeant position to cover B- and C-shifts. *Maritime Operations* • The MRTCC aims to equip the Maritime Unit/Marine Patrol with sites to monitor waterways. **582 Cameras; 9 Personnel; 86% of weekly hours covered**

<u>Logic Model</u>

A logic model was constructed to help identify the main components of the Miami MRTCC, their functionality, and intended impact (Figure 1.) The primary objective of the unit is to provide real-time, actionable intelligence to officers responding to high-priority calls, developing situations or critical incidents. Additional objectives of the unit consist of supporting the core mission of the organization and better serving the community through centralized and improved investigative capabilities. The following section discusses the model in greater detail.

Figure 1. City of Miami Police Department Real Time Crime Center Logic Model

Objectives	The primary objectives of the MRTCC are to 1) provide real-time, actionable intelligence to officers responding to priority calls, developing situations and critical incidents; 2) support the core business of the department and 3) serve the community through centralized and improved investigative capabilities. The situational awareness facilitated by the ability to collect, analyze, and disseminate information to officers in rapid times will allows officers to supplement their tactical decision making and improve officer safety.

Components
Personnel
• RTCC Detectives
• RTCC Intelligence Detectives
• Video Retrieval Specialist
• Contractors
Hard Technologies
• CCTV
• LPR
• Gunshot detection system
• Post-incident facial recognition (Faces, Clearview)
• Video analytics (BriefCam)
Information Sources
• Social media (Facebook, Twitter, Instagram)
• Open-source derived (e.g., Google, First Alert)
• Live or historical calls for service information
• Criminal history
• Intelligence databases
• Local news media

Functions
• Active surveillance
• Real-time incident response
• Post-incident investigative support
• Command Center
Activities
• Resource deployment
• Evidence identification
• Evidence acquisition
• Evidence storage
• Intelligence sharing

Information Recipients
• Office of the Chief
• Criminal Investigations
- CID (Violent and Property Crime)
- SIS (Gangs, Narcotics, Terrorism)
- ISS (Intelligence)
• Patrol
• Local, State, Federal Partners
Supports
• CompStat meetings
• Violent crime meetings

Outcomes
• Improve police response time
• Improve clearance rates
• Improve time to clearance
• Improve officer safety
• Reduce use of force incidents

Note	The goals and objectives of the MRTCC are aligned with the needs and interest of the police agency. As such, the MRTCC is expected to continually evolve as it concerns personnel duties, operating practices, technological intricacy, and overall functions.

Components

The primary components of the MRTCC can be grouped by personnel structure, hard forms of technologies, and information sources. As it concerns personnel, immediate MRTCC operations are overseen by the Unit Commander/Lieutenant and Sergeant. The unit is staffed with real-time crime center and criminal intelligence detectives who perform investigative tasks, such as monitoring, interpreting, and disseminating information from the various systems employed within the unit. Whereas the real-time crime center detectives primarily operate the CCTV, LPR, and gunshot detection software, criminal intelligence detectives devote most of their time to recovering information from social media and facial recognition portals. The civilian video retrieval specialist is entrusted to properly deploy and retrieve technology within the field and ensure its functionality and reliability at all times. Independent contractors perform other assignments as needed or outlined by the department (e.g., data restructuring, synthesizing data systems, process, and outcome evaluations).

Technologies

The MRTCC is equipped with a spectrum of continually evolving hard technologies and information sources that are capable of expanded access. Hard technologies are tangible components and software within the MRTCC that do not always require active handling or monitoring by personnel. The primary hard technologies integrated into the Miami RTCC operations include CCTVs, LPRs (Clarity, Vigilant), gun-shot detection systems (ShotSpotter), video analytics (BriefCam), and facial recognition software (Faces, Clearview). Soft information sources require human areas of decision-making or concept formation. This includes social media searches (e.g., Facebook, Instagram, Twitter), open-source derived information (e.g., Google

searches), scanning and analyzing historical calls for service information, criminal history/intelligence databases (e.g., DAVID), and the local news media.

Functions and activities

The MRTCC has the capacity to function in four primary ways: 1) through active monitoring, to prevent an incident from occurring or escalating, 2) in real-time, to share information and support decision-making in the field, 3) post-incident, to produce evidence as a form of post-incident investigative support, and 4) to support large-scale events, as a command center or critical incident support unit. Common activities include the deployment of resources to high crime areas, the identification, acquisition, and storage of evidence, and the sharing of intelligence information.

Information recipients

Internal units that benefit from the MRTCC include the Office of the Chief, Criminal Investigations Division, Special Investigations Section, Investigative Support Section and Patrol. Intelligence information and evidence acquired by the MRTCC also support bi-weekly violent crime meetings and monthly CompStat meetings held by the department. External information recipients include local, state, and federal partners, including fusion centers.

Outputs

The situational awareness facilitated by the new-found ability to harness, synthesize, and disseminate information to officers in route to crimes in progress is intended to improve the following outcome measures: police response time, clearance rates, time to case clearance, officer safety, and the reduction of the use of force incidents. These goals and objectives are aligned with the needs and interests of the Miami Police Department. As such, the MRTCC is expected to continually evolve as it concerns overall operating practices and functions.

<u>Standard Operating Procedures</u>

      A fundamental step in establishing routine operations and uniformity of performance was the development of real-time crime center standard operating procedures. This was also one of the strategic steps needed to effectively deliver a functioning MRTCC. The SOP was signed into effect on April 7th, 2021, and outlines the mission, goals, and objectives of the unit, duties of command personnel and its members, as well as the purpose and scope of commonly accessed technologies (see Appendix A).

Data and Intelligence

Data and intelligence were integral in the development and functioning of the MRTCC. The various platforms and innovative information technologies situated within the unit offer a unique service to the MRTCC operators and their frequent users. The agency recognizes the value of actionable intelligence and has facilitated informed decision-making within the field. Data has also proven to be central to the research partner in assessing the impact of the MRTCC on case processing. In that regard, there were three data sources maintained by the research partner that allowed for further assessment (see Table 2).

MRTCC Incident Log

Purpose

The internal MRTCC log served as a method of performance measurement which was used in multiple ways. For one, the log acted as an in-unit record that allowed MRTCC personnel to document their daily activities and work associated with requested incident support. Second, the MRTCC log allowed the Sergeant to check the productivity of personnel, identify trends in workloads, and provide statistics to supervisors on an as-needed basis. Third, the log demonstrated the increased responsibilities placed on the unit over time and proved critical in building the case for additional resources to meet the internal demand for assistance. Finally, the incidents recorded within the internal MRTCC log provided a framework for the development of the extended log maintained by the research partner.

Assembly

The MRTCC unit personnel (e.g., detectives, sworn personnel) were tasked with recording all activity that occurred during operating hours. This included any occurrences that were brought to the attention of the MRTCC staff through either dispatch or officers in the field, and whether

material assistance was provided by the MRTCC. This also included incidents that were identified by MRTCC detectives through active monitoring and cases in which the MRTCC was asked to assist in the post-incident investigative process.

Table 2. Overview of Data Sources used in the MRTCC Project Evaluation

	MRTCC Incident Log	**MRTCC Expanded Analytical Database**	**Control Sample**
Purpose	• Performance measurement • Justification of resource allocation • Foundation for expanded analytical database	• Capture additional measures • Facilitate controlling of case-level features in network and outcome analyses	• Facilitate quasi-experimental design • Allow for comparison with MRTCC sample case characteristics and outcomes
Assembly	• MRTCC unit personnel • Research partner • Systematic	• Research partner • Systematic	• Research partner • Proportionate Stratified • Random selection
Time period	• January 2019 - April 2022	• January 2019 - April 2022	• January 2019 - April 2022
Measures	• Incident information • MRTCC support provided	• Incident information • MRTCC support provided • Victim characteristics • Human evidence • Crime scene evidence • Warrants • Manpower	• Incident information • MRTCC support provided • Victim characteristics • Human evidence • Crime scene evidence • Warrants • Manpower
Validation	• Research partner review • Exhaustive via multiple data systems	• Research partner review • Exhaustive via multiple data systems	• Research partner review • Exhaustive via multiple data systems

When an incident was brought to the attention of MRTCC personnel during the time of initial response, information sequencing occurred in one of two ways. MRTCC personnel were either informed of the incident through dispatch or solicited by officers in the field to provide support. When a call was dispatch-initiated, the incident number was generated through the

computer-aided dispatch system and was entered into the log as an identifier by MRTCC personnel. When a call was raised by patrol, either the same process occurred, or patrol advised the MRTCC detectives of a generated case number. Any immediate information obtained from dispatch or officers in the field was also entered into the log at that time (e.g., location, vehicle, weapon used, etc.) along with an indication of the information sources utilized and any additional notes pertaining to the incident.

For post-investigative support purposes there were two procedures for obtaining support from the MRTCC. For requests related to video retrieval, an online video request form was submitted by the lead detective which was routed to the MRTCC. This form was reviewed by the MRTCC Sergeant who either approved or denied the request based on whether the MRTCC had resources that covered the area of the incident in question. If the request was denied, the incident was not recorded in the log. For those that were approved and processed, the case number was recorded in the log. The second procedure related to all other requests that were not video related. In those instances, detectives sent an email request to the MRTCC unit for specific support. For occurrences that were identified through active monitoring, MRTCC personnel simply recorded the activity in the log. For these instances, there were no formal case numbers that were developed and required no added data validation.

Activities recorded in the log also included administrative tasks such as assistance with Crime Stoppers tips and validations, daily event emails providing updates on planned protests and demonstrations, surveillance reviews, Shot Spotter reports, the deployment of trailers, and public record requests, among others.

Time period of entries

The assembly of the internal MRTCC log began in January of 2020. The internal MRTCC consisted of 3,636 entries, of which 2,228 involved an incident resulting in an assigned case number. Once duplicate case numbers were removed, 1,871 unique incidents remained, and select violent crime types were extracted for the purpose of eventual evaluation. Note that the MRTCC aided all possible calls for service, not only violent crime cases. Despite the date of assembly, the oldest incident that the MRTCC provided post-incident investigative support to transpired on January 16th, 2019.[3] The research partner maintained the internal data log through April 30, 2022.

Data cleaning and validity checks

On a weekly basis, the research partner systematically reviewed the internal MRTCC log and validated the information initially recorded in the log. Any missing information was also added at this time. For instances in which the MRTCC personnel are unable to obtain an identifier, MPD's crime analyst tool was utilized to locate the appropriate case number. This tool can extract all incidents that occurred in a specified area and timeframe. Once an incident or case number was identified, the Department's records management system, *PremierOne* was utilized. The record management system stores information pertaining to the type of incident (i.e., signal number), the location of the incident, whether an arrest was made and any additional case details. This information was extracted and added in the log by the research partner.

The researchers also relied on three other sources of information to ensure the validity of the log. First, the MRTCC personnel indicated the information technologies used to assist the individual or unit in the notes section of the database when initially logging the incident. The researcher then ensured that those details were properly coded within the relevant measures.

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[3] Recorded incidents may precede the development of the log as new investigative leads develop and additional assistance is needed.

Second, case files within *PremierOne* were reviewed to identify instances when the MRTCC provided support and the types of information received. Each case entry was then compared to the record management system information to ensure proper coding. Third, request emails sent directly to the unit detectives were reviewed to ensure that the log properly documented all the applicable information technologies used to support the investigation. Where information was either inaccurate or missing, the research partner corrected this in the log.

Measures

With input from command staff, the research team identified sixteen distinctive measures that captured activities performed by the MRTCC in the process of responding to or assisting with incidents. Measures that aided with the identification of an incident included the case number, date of the incident, time of the incident, type of incident signal, the location and NET area where the incident occurred, the unit assisted, and the type of service provided (i.e., real-time, post-incident, active monitoring). Numerical measures pertaining to the incident included whether an arrest(s) occurred and whether the arrest resulted in felony or misdemeanor charges. Additional dichotomous measures pertained to whether weapons and narcotics were recovered, and whether a vehicle was involved. The types of MRTCC resources accessed in support of a case were coded categorically. Each type of resource used for each incident (e.g., CCTV, Clearview, ShotSpotter) was recorded. Lastly, personnel provided their personal identification number and described the assistance provided in a column designated for additional notes. This log structure was viewed as sustainable by MRTCC personnel (see Appendix B).

Expanded MRTCC Analytical Data

Purpose

The purpose of the expanded database was to capture additional measures for all violent crime incidents which received support from the MRTCC. The incidents recorded within the expanded MRTCC database had all received real-time or post-hoc deployment of information from the MRTCC to responding officers or detectives. The extended database allowed for more in-depth analysis in the assessment of selected outcomes for incidents treated by the MRTCC compared to non-MRTCC incidents. The procedure for incident collection and recording within the extended MRTCC database was as follows.

Assembly

With each identified case number, exhaustive steps were taken to acquire the additional information needed to build the extended database and to ensure that measures within the database were coded with certainty. These steps involved accessing the police department's record management system, *PremierOne,* reviewing reports of investigations (301 reports), querying the department-wide email system, attending bi-weekly violent crime meetings, and reading through OneNote documents. The following illustrates the systematic process developed by the research partner.

Each incident number within the extended database was first queried within *PremierOne* to access the case folder devoted to the incident. The initial report uploaded within the system allowed the research partner to obtain information on the time of occurrence, the amount of manpower assigned to the case, and the overall description of the incident (i.e., what transpired, number of victims, suspects, and witnesses). The initial report also provided some detail on the traditional investigative methods utilized (e.g., whether CSI was requested). This information was often submitted into the system by dispatchers or patrol officers who first arrived on the scene.

Next, reports of investigation (or 301 reports) were accessed. These reports were often found attached to the *PremierOne* case files and provided a more detailed account of the incident through subsequent investigation. These reports were typically submitted by detectives and approved by their superiors. In the instance that a 301 report was not attached to the case file, a secondary search was conducted within the department-wide email system.

Email queries also produced additional information that was not always readily available within the RMS system. These queries verified items such as: whether information flyers were produced on the subject, victim, or vehicles involved, whether felony apprehension team packets were submitted, whether arrest forms were uploaded, and whether the National Integrated Ballistic Information Network (NIBIN) was utilized. Finally, the email queries also drew out MRTCC personnel end-of-shift reports which documented their involvement in note-worthy incidents.

Additional steps were taken for classified cases such as homicides. To capture all the resources employed within the investigation of these incidents, the research partner attended bi-weekly violent crime meetings and read through the subsequent OneNote documents that were assembled as part of the information-sharing process developed within the agency. These documents captured information regarding new investigative leads, any additional witnesses or victims that may have surfaced, the use of cellphone and search warrants, and any additional intelligence information or activities that may have developed over the course of the investigation.

Time period of entries

The data collection for the extended MRTCC analytical database occurred simultaneously with the internal MRTCC incident log. The research partner maintained the internal incident log and extracted all applicable cases to be included within the expanded database for further analysis. Data collection was concluded on April 30th, 2022, to allow for the assembly of the non-MRTCC

treated control sample. The violent crime incidents recorded within the extended MRTCC database are comprehensive. That is, all homicides, aggravated assaults, robberies, sexual assaults, and domestic violence incidents that were included and validated within the internal MRTCC log, were also captured within the extended database. Selected property crimes (e.g., burglaries, larceny thefts, vandalism) were likewise included within the extended database but are outside the scope of the current project evaluation. The extended analytical database consisted of a total number of 776 incidents, of which 648 were violent crimes. The time period of cases within the expanded MRTCC database was naturally the same as that in the MRTCC incident log, from January 16th, 2019, to April 30th, 2022.

Measures

The extended MRTCC analytical database included 41 additional measures beyond those contained in the MRTCC data log. Of these measures, roughly 80 percent were coded dichotomously. These measures consisted of all unique technology and information sources accessed (e.g., CCTV, LPR, facial recognition), as well as traditional investigative methods utilized (witness statements, information flyers, line-ups). These were dichotomously coded in one of two ways: 1) in a manner that detailed the access and use of the selected technology/information source or method (1 = yes it was utilized, 0 = no it was not utilized); or 2) in a manner that depicted is evidence was recovered (e.g., 1 = yes there was evidence from the CCTV, or 0 = no, CCTV was accessed and reviewed but there was no evidence). Numeric measures detailed the number of officers, victims, witnesses, and suspects involved in the processing of the case, as well as the hours and days it took to clear all applicable cases. The detailed coding arrangement for these measures, and all others, can be found in Appendix B.

Control Analytical Data

Purpose

A control sample of similar cases not receiving MRTCC support was randomly drawn to compare and isolate the impact of MRTCC assistance on case outcomes. These non-treated calls for service were those dispatched to officers who responded to incidents through traditional operating procedures and without the assistance of the centralized MRTCC unit. The procedure for incident collection and recording within this control sample entailed the following.

Assembly

To ensure equivalency between the MRTCC-treated sample and the control sample, a proportionate stratified random sampling procedure was used. First, the frequency of cases in the MRTCC sample within neighborhood enforcement areas (NETs) and for each violent crime type was calculated. These two criteria, crime type and NET area, were used to stratify the groups from within which the control sample would be drawn so that the proportion of cases in the control sample would be the same for these two strata. Thus, the MRTCC sample and the control sample had the same number of cases for each NET area and for each crime type. This ensured equivalency on these two dimensions and effectively controlled for the influence of neighborhood effects and crime-type effects on case outcomes. The distribution of frequencies and tests for equivalence between the MRTCC and control sample are reported in Appendix C. To generate a sampling frame from which the control sample could be randomly drawn from within each stratum, an automated pull[4] was queried through the RMS system for each unique crime type and specified NET area. Once the sampling frame was generated a three-step process was followed.

First, the incidents from the expanded MRTCC analytical data log were extracted from the automated pull to ensure that no MRTCC-assisted cases were drawn in the process of random

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[4] An automated pull searches and assembles a list of cases based on various search terms entered by the user.

selection. Second, a random integer set generator was utilized to identify the incidents selected for the control log (Randomness and Integrity Services, n.d.). One set was generated with a specified number of unique random integers. The integers were assigned a value between 1 and the total number of incidents generated from the automated pull for the specific crime signal and NET area. The randomness from the selected generator stems from atmospheric noise, which for many purposes is better than pseudo-random number algorithms traditionally used in computer programs (Marangon, Vallone, & Villoresi, 2014). Finally, the number produced by the generator was matched with the number assigned to each incident within the specified automated pull. The matched incident was extracted and placed into the control log. This process was repeated for each signal type and NET area in the log.

Time period of entries

Data collection for the control analytical sample began in May 2022 and concluded in July 2022. To support the proposed analytical design, the control log consisted of 776 non-MRTCC treated cases. These incidents were equivalent to the MRTCC-treated group as it concerns the crime type/signal and associated NET areas (see Appendix C). The sampling period from which the control cases were randomly drawn was the same as that of the MRTCC log and the MRTCC expanded analytical sample. That is, January 16th, 2019, to April 30th, 2022.

Measures

The exact same measures included within the MRTCC analytical sample were replicated within the control group to meet the conditions of the experimental design (see Appendix B).

Analysis and Evaluation

To determine the impact of the MRTCC on police practice and its influence on the processing of violent crime incidents, a mixed-methods study design was used, which consisted of three parts. Each of these analyses addressed a different aspect of the processes and outcomes of the MRTCC. The first part entailed a qualitative survey of the frequent users of the MRTCC technologies across various MPD units to understand the role that the MRTCC played in their assignments and any perceived benefits it provided. The second part consisted of a network analysis of violent crime incident case components to visualize and empirically determine how MRTCC technologies had become integrated into case processing within the MPD. This is important to assess because the analysis demonstrates the degree to which various elements across the MPD utilize and integrate MRTCC products within case processing. Further, this highlights opportunities for the MRTCC to influence other units within the organization while also giving an indication of its sustainability. Part three of the analysis was devoted to understanding the impact of MRTCC technologies on the rate of case clearances among violent crime incidents and the time it took to clear those cases. The MRTCC project was assessed and evaluated by the independent research partner, which included a criminology faculty member and an embedded doctoral student.

Part I: Utilization and Perception of the MRTCC

The first component of the evaluation was devoted to answering two primary research questions: 1) "To what extent and in what ways were MPD personnel utilizing MRTCC technologies?" and 2) "What were the perceptions among MPD personnel of the MRTCC in terms of coverage, accessibility, and usefulness?" As the MRTCC developed the capability to provide real-time information technology to support officers in high-crime areas throughout the city, it became apparent that before outcome measures could be assessed there was a need to better understand the extent to which MRTCC technologies were being utilized by MPD personnel, how

they were being used across the various units, and how MPD personnel perceived the usefulness of MRTCC technologies. This qualitative assessment provided insight into how MRTCC technologies were utilized by MPD which could be useful for other agencies nationally and internationally who are interested in developing their own real-time information platforms. These qualitative findings could also be used to refine and improve the MRTCC going forward. Finally, the qualitative findings could also assist in understanding better the empirical outcomes.

Method

Instrument and data collection

To better understand MRTCC user perspectives a survey was constructed. The survey consisted of 29 questions, 17 of which were closed-ended and 12 of which were open-ended. The survey questions fell within four topical categories of information: demographics and respondent non-identifying information, respondents' use of MRTCC technologies, respondents' views on the benefits of the MRTCC, and the perceived limitations and ways the MRTCC could be improved. Qualtrics, an online survey software system, was used to assist in administering and recording responses. A complete copy of the survey instrument can be found in Appendix D.

The survey was administered in person by the research partners. All surveys were conducted at MPD headquarters in one of three conference rooms at various times of the day and night as relevant to the shift schedules of respondents. It was decided to administer the surveys to respondents rather than allowing them to complete the surveys on their own for two primary reasons. First, based on prior experience it was believed that were the surveys sent out via email for respondents to complete on their own, insufficient response rates would be achieved. Second, administering the surveys in person would allow the researchers to prompt and ask additional questions during open-ended responses which would facilitate better understanding and assist in

clarifying the information received. Verbal informed consent was obtained from each respondent before survey administration, and the survey instrument was submitted and certified by the university IRB prior to administration. All surveys were conducted near the end of the project term (mostly during the month of May 2022) which allowed time for the development and use of the MRTCC by sampled respondents.

Sampling procedure

To ensure that the information received from respondents was representative of those within the Miami PD who frequently utilized MRTCC technologies, an analysis of the MRTCC incident log was completed to determine the proportion of cases across NET areas and detective units that the MRTCC had assisted (see Table 3).[5] Given the arrangement, a disproportionate randomized sampling procedure was used along with some selection of individuals where there was only one relevant person to survey. A disproportionate sampling procedure was used since within some stratified units the percentages became too small to ensure that they would produce usable pools of respondents were they drawn proportionate to the proportion of the incidents occurring in that area or unit which were represented in the incident log. In other words, a proportionate sample would mean only one individual would be sampled from some of the areas and units, and by chance, they may not have used MRTCC services and thereby could provide no useful information. Drawing a disproportionate, equal number of respondents across the NET areas and detective units, increased the likelihood that valid information would be received.

Table 3. Qualitative Surveys of MPD MRTCC Users Sampling Design

Net Area/Unit	Assigned Personnel (N)	MRTCC Incident Log Proportion	Sampling Procedure	Sampled (N)	Surveyed

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[5] See the previous "Data and Intelligence" section for more details on the procedures for the development and maintenance of the MRTCC incident log.

Downtown	**40**	19%			
Commander	1		Selected	1	1
Patrol	39		Random	3	3
Overtown (rescheduled)	**34**	18%			
Commander	1		Selected	1	1
Patrol	33		Random	3	3
Little Haiti	**40**	16%			
Commander	1		Selected	1	1
Patrol	39		Random	3	3
Model City	**38**	12%			
Commander	1		Selected	1	1
Patrol	37		Random	3	3
Wynwood	**37**	10%			
Commander	1		Selected	1	1
Patrol	36		Random	3	3
Allapattah	**44**	9%			
Commander	1		Selected	1	1
Patrol	43		Random	3	3
Criminal Investigations Division (CID)					
Criminal Investigations Section (CIS)	58	39%	Random	10	10
Special Investigations Section (SIS)	12	11%	Random	5	1
Investigative Support Section (ISS)	28	9%	Random	5	5
Real Time Crime Center (MRTCC)	9	100%	Selected	5	5
Field Operations Division (FOD)					
Special Events Unit (SEU)	9	N.D	Selected*	1	1
	349		**Total N =**	50	46

Notes: * The SEU Lieutenant was selected for survey as the primary liaison with MRTCC. N.D. = not determinable. For Net areas, sampling was drawn from shifts B and C only as A shift rarely accesses MRTCC services.

The sampling frame was stratified on two dimensions. The first stratification was by NET areas and Detective Units where MRTCC technologies had been deployed and were frequently used in support of violent crime incident responses. The second stratification was by officer position. Three positions were sampled: patrol officers which were drawn randomly by NET area, detectives who were drawn randomly across detective units, and NET area commanders who were

selected as there is only one commander per NET area. Additionally, the special events unit frequently utilized MRTCC technologies in managing public events and that unit supervisor was selected and surveyed. Further detail on the sampling frame and procedure is reported in Table 3.

Table 4. Sampling Structure of Criminal Investigations Division (CID) Sub-Units

CID Unit	MRTCC Incident Log Representation	Sampling Procedure	Sampled (n)	Surveyed (n)
Criminal Investigations Section (CIS)	39%	Random	10	10
Robbery	27%		2	2
Aggravated Assaults	18%		2	2
Homicide	11%		2	2
Burglary	11%		2	2
Theft from Motor Vehicle	7%		2	2
Special Investigations Section (SIS)	11%	Random	5	1
Narcotics	21%		3	1
Gangs	19%		2	0
Investigative Support Section (ISS)	9%	Random	5	5
Felony Apprehension Team	23%		3	3
Domestic Violence Apprehension Team	17%		2	2
		Sub-total =	**20**	**16**

With the sampling frame devised a list of personnel from each of the detective units and NET areas were obtained from human resources. From that list the random selection was drawn utilizing numbers placed in a hat and selected blindly. This arrangement resulted in a targeted sample of 50 respondents. Once the roster of individuals was drawn, efforts were then made to schedule times to administer the surveys in accordance with each respondent's schedule. In the end, of these intended 50 participants, 46 respondents ultimately participated in the surveys. Details on those sampled and surveyed can also be found in Table 3 and Table 4.

An overview of the respondents (N = 46) who participated in the surveys can be found in Table 5. Most respondents were male (n = 40), with only six respondents being female (13%). Additionally, most respondents were Hispanic with 65 percent (n = 30), followed by Black/African American

with 22 percent (n = 10), with the remainder being White with 9 percent (n = 4) and 4 percent

comprised of Asian/Pacific Islanders (n = 2). Most respondents were either detectives or officers,

with the former comprising 43 percent (n = 20) and the latter comprising 41 percent (n =

Table 5. Overview of Survey Respondents

N = 46	Frequency (n)	Percent (%)
Gender		
Female	6	13%
Male	40	87%
Ethnicity		
Asian/Pacific Islander	2	4%
Black/African American	10	22%
Hispanic/Latino	30	65%
White	4	9%
Position/Rank		
Commander	6	13%
Lieutenant	1	2%
Detective	20	43%
Officer	19	41%
Years in service		
≤ 1 to 5 years	11	24%
6 to 10 years	20	43%
11 to 15 years	5	11%
16 years or more	10	22%
Years in current position		
≤ 1 to 5 years	34	74%
6 to 10 years	8	17%
11 to 15 years	2	4%
16 years or more	2	4%

19). The next largest position held by respondents was Commander with 13 percent (n = 6) and

the fewest held the rank of Lieutenant with just 2 percent (n = 1). Most respondents had been

employed with the MPD between 6 to 10 years (n = 20, 43%), followed by 16 or more years of

service (n = 10, 22%). A smaller proportion, 24 percent (n = 11), had been with the department for

five years or less and the least reported timeframe was between 11 to 15 years of service (n = 5,

11%). Finally, most respondents reported having been in their current position for five years or

less with 74 percent (n = 34), followed by 6 to 8 years in their current position with 17 percent (n = 8). Fewer respondents reported being in their current position for 16 or more years with 22 percent (n = 10) and the least reported being in their position for 11 to 15 years at 11 percent (n = 5).

Findings

The surveys of police officers, detectives, and NET area commanders revealed several thematic findings. These themes relate to the extent to which MRTCC technologies had become integrated into police practices, the ways that it has impacted those practices, the benefits that it was perceived to provide, and views on how the MRTCC could be improved.

1. <u>The use of MRTCC technologies has now become a regular part of carrying out their duties.</u>

A primary finding from the surveys was that MRTCC technologies had become a regular part of doing business within the Miami Police Department. Many reported that it become part of the "standard operating procedure" when dealing with crime incidents. Table 6 presents the frequency, type of technology used, and accessibility of MRTCC usage across the survey respondents. Most respondents (n = 32, 70%) reported that they utilized the technologies housed within the MRTCC on either a daily or weekly basis. Among these, the most frequent response was either using it daily or one to two times per week. A smaller proportion, 20 percent of respondents (n = 9), indicated that they utilized MRTCC technologies monthly ranging from one to four times per month, while one respondent indicated they used it only rarely (about one to two times per year).

Table 6. Frequency, Type, and Accessibility of MRTCC usage among Respondents

N = 46	Frequency (n)	Percent (%)

How often (on average) do you typically access information housed within the MRTCC in carrying out your work? (open-ended)		
None	2	4%
Daily	11	24%
1-2 times per week	13	28%
up to 3 times per week	5	11%
4 - 5 times per week	3	7%
1 - 3 times per month	9	20%
3 - 4 month	2	4%
1 - 2 per year	1	2%
Which technologies or information do you most frequently access/request from the MRTCC? (open-ended)		
CCTV	42	91%
Facial recognition software	13	28%
License plate readers (LPR)	13	28%
Gunshot detection system	7	15%
Social media	6	13%
Intelligence databases	1	2%
How long on average does it take for you to retrieve and/or receive information from the MRTCC once it is requested? (open-ended)		
Within minutes	22	48%
Within hours	9	20%
Within a day or two	13	28%
N/a	2	4%

By far the most frequently used technology housed within the MRTCC was video footage from CCTV cameras. Among respondents, 91 percent (n = 42) indicated that they most frequently requested CCTV support. The next most frequently reported technology requested was facial recognition software and license plate readers, with 28 percent of respondents (n = 13) regularly requesting those technologies to support their work. Gunshot detection systems and social media search requests were the next common technologies reported being used among respondents, with 15 percent (n = 7) and 13 percent (n = 6) of respondents citing those technologies, respectively. Lastly, only one respondent indicated requesting the use of intelligence database searches (2%).

Figure 2. Reported Ease of Accessing Information from the MRTCC
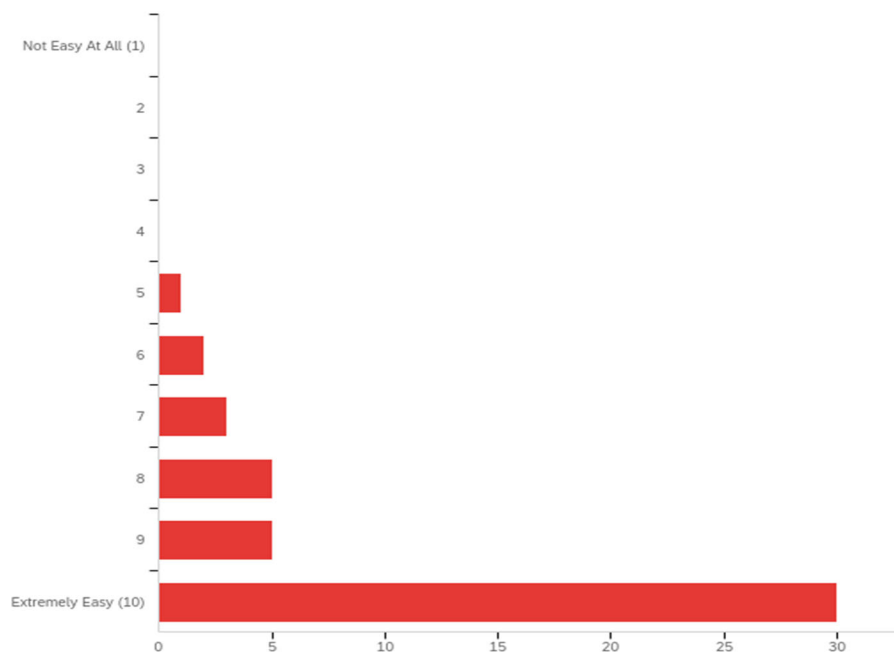
Question: On a scale of 1 to 10 how easy is it for you to obtain information from the MRTCC in support of your work?

Survey respondents also indicated that receiving information from the MRTCC was extremely quick and easy. Nearly half of all respondents (48%) indicated that information was received within minutes of requesting it and that when MRTCC detectives were on duty they are always accessible. Another 20 percent of respondents (n = 9) indicated that they regularly receive information within an hour or two upon requesting it. Around 28 percent (n = 13) of respondents reported that they usually receive information within 24 hours after submitting a request. Finally, for two of the respondents (4%) this question was not applicable as they were able to access some of the MRTCC technologies directly without submitting a request.[6] Further underscoring the ease

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[6] For instance, NET Commanders can directly access CCTV footage in their operational areas. Some patrol officers in specific areas are also able to access gunshot detection system software directly in their patrol cars without contacting the MRTCC.

of accessing information within the MRTCC, an additional closed-ended question asked respondents to report how easy it was for them to obtain information on a scale of 1 to 10, with 10 being the easiest (see Figure 2). Sixty-five percent of respondents (n = 30) indicated a score of 10, with an additional 22 percent (n = 10) recording a score of 8 or 9.

2. <u>Real-time crime center technologies are perceived to have increased the resources available to officers and improved their ability to carry out their duties.</u>

Most respondents indicated that the MRTCC technologies are very useful to officers as it provides both a broader view of their operational landscape and that it allows them to gather timely and accurate information regarding incidents that they are dealing with. Many stated that the MRTCC technologies are an "extra tool" that they used to carry out their duties. One respondent stated that it is becoming expected in the prosecution of cases to be able to provide video or other technology-based evidence. Another indicated that they use information from video footage to help to determine what happened when they are given conflicting statements by witnesses. Several respondents also indicated that the MRTCC doesn't always capture the information that is needed, however, when they do it is extremely useful for both recording information but also assisting in identifying suspects. The following are a few excerpts from the statements provided by a selection of survey respondents:

> "If they are available and they capture the incident, it plays a very helpful role in making sense of whatever we're dealing with." (Patrol officer)

> "It's part of my process. It's another tool on my belt." (Patrol officer)

> "For facial rec. it's great, I don't have to take time out of my case to run that information. LPR, the same thing, they can handle that part for me. It gives me a good view of a lot that occurs. I contact MRTCC for every single case that I have, even if it is non-criminal (natural death, unclassified). They really help with identifying individuals." (Detective)

> "When we have conflicting stories, MRTCC is able to review and tell us what's actually going on." (Patrol officer)

"Useful tool to be able to document incidents, providing descriptions and tags of vehicles. We now check with MRTCC first to advise us, before it was word of mouth from witnesses, victims, etc. We get stories from victims and then reach out to MRTCC for information." (Patrol officer)

"Plays a major role, surveillance allows us to identify individuals, plates. Not just within [our] unit, but in other units, the camera footage shows us exactly how the incident occurred, and the direction of approach of subjects or vehicles. Surveillance is everything. Nowadays with the State Attorney's office, surveillance is the flavor of the day. It's expected in prosecution cases…" (Detective)

"Very critical for when we have to identify someone. Plays a big role. Facial recognition assists us to ID people. Back then we didn't have the same access, we would rely on witnesses or media releases. People aren't as willing to help as much as technology can." (Detective)

Figure 3. How often Information from the MRTCC is Used
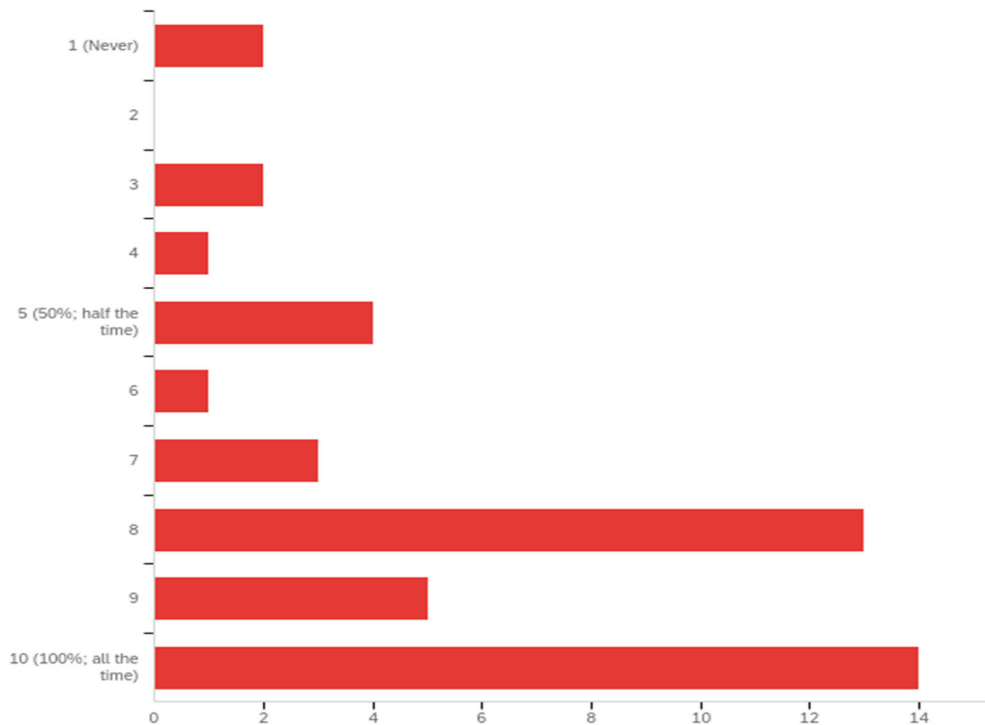
Question: How often is the information you receive from the MRTCC used to decide how or what you would do next in your work?

Similarly, most respondents indicated that the information that is received from the MRTCC is frequently used in determining what their next steps will be either in responding to a call or in conducting an investigation (see Figure 3). In particular, 31 percent (n = 14) indicated that they always use information from the MRTCC to determine the next steps. An additional 39

percent of respondents (n = 18) estimated that they utilize MRTCC information 8 or 9 out of 10 times to determine what their next steps will be. Further, 93 percent of respondents (n = 43) either strongly agreed or agreed with the statement that the establishment of the MRTCC had improved their ability to perform their duties (see Figure 4).

Figure 4. Perceptions of MRTCC Having Improved Ability to Carry out Duties
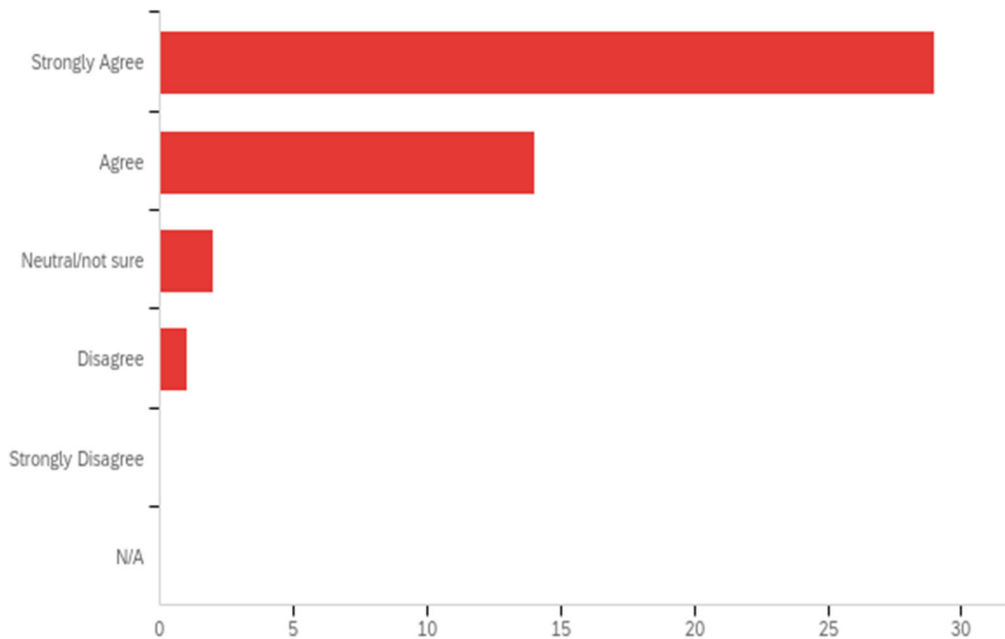
Question: Overall, the establishment of the MRTCC has improved my ability to carry out my duties.

3. <u>MRTCC technologies are perceived to have improved the ability to identify and collect evidence in the investigative process.</u>

Most survey respondents also perceived that the MRTCC technologies had improved their ability to develop investigative leads, gather evidence in support of case processing, and improved the efficiency (i.e., reduce the amount of time) of gathering evidence in the processing of crime

incidents. For instance, among survey respondents, 91 percent (N = 42) agreed or strongly agreed with the statement that MRTCC technologies had improved their ability to develop investigative leads. Another 4 percent were unsure or neutral, while only 1 respondent disagreed and 1 was unable to determine (see Figure 5). Similarly, a large majority of respondents (93%, n = 43) strongly agreed or agreed that the MRTCC technologies had improved their ability to gather evidence in support of their work responding to and investigating violent crime incidents (see Figure 6). Additionally, two survey respondents (4%) were not sure or were neutral in making that determination, while one respondent disagreed (2%).

Further still, many respondents felt not only that the MRTCC improved their ability to gather evidence but that it also shortened the amount of time that it took to identify investigative leads and/or gather that evidence (see Figure 7). In this regard, 85 percent of respondents (N = 39) either strongly agreed or agreed that the time to identify and gather evidence was reduced. An additional 11 percent (n = 5) were not sure or neutral in making that determination, while 2 respondents (4%) disagreed.

Figure 5. Perceptions of MRTCC Having Improved Investigative Leads
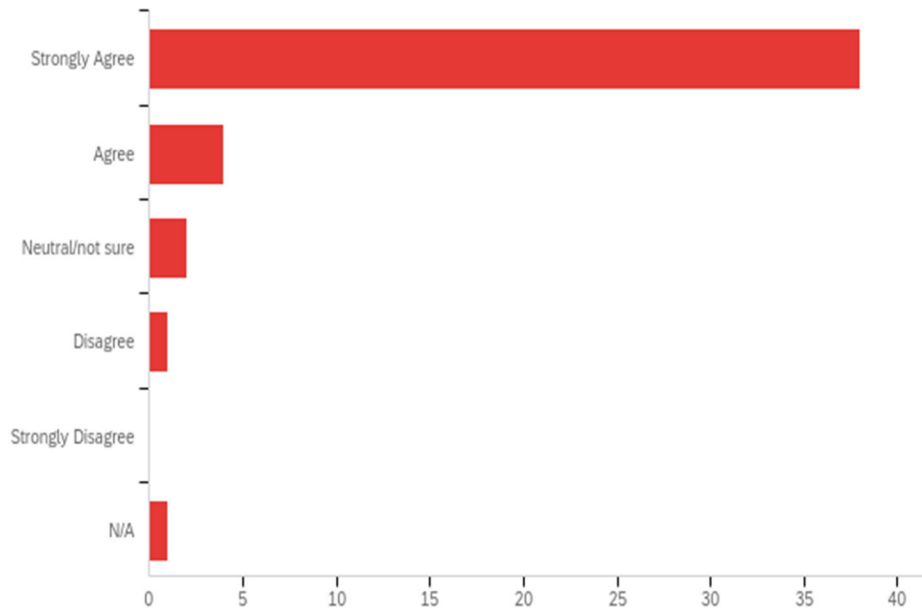
Question: Based on your experience and if applicable, the MRTCC has improved the ability to develop investigative leads in support of my work.

Figure 6. Perceptions of MRTCC Having Improved Evidence Gathering
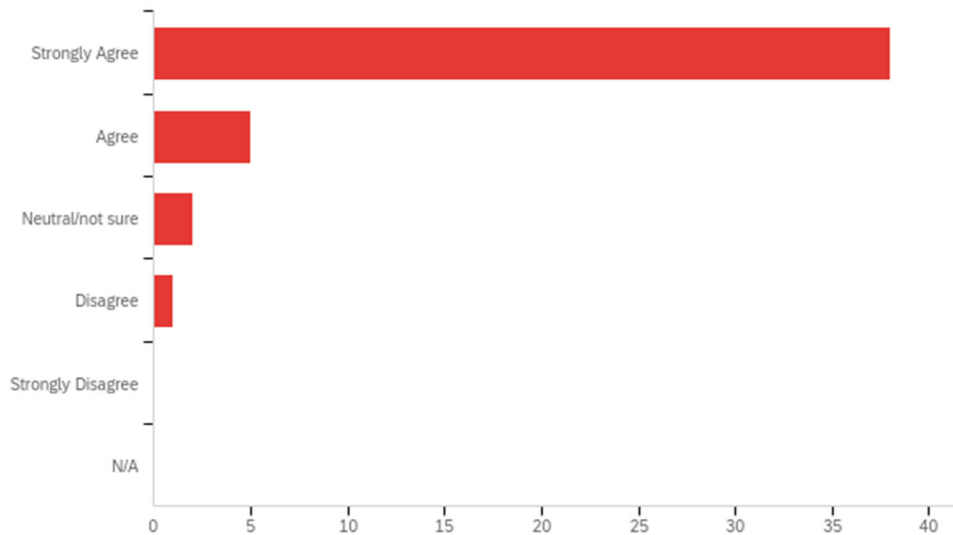
Question: Based on your experience and if applicable, the MRTCC has improved the ability to gather evidence in support of my work.

Figure 7. Perceptions of MRTCC Having Shortened Time to Gather Evidence

Question: Based on your experience and if applicable, the MRTCC has shortened the amount of time that it takes to gather evidence and/or develop investigative leads.

4. <u>MRTCC technologies are perceived to have improved case clearances and reduced time to clear cases.</u>

Most respondents also perceived that the MRTCC technologies had increased the department's ability to clear cases. Although this perception was slightly le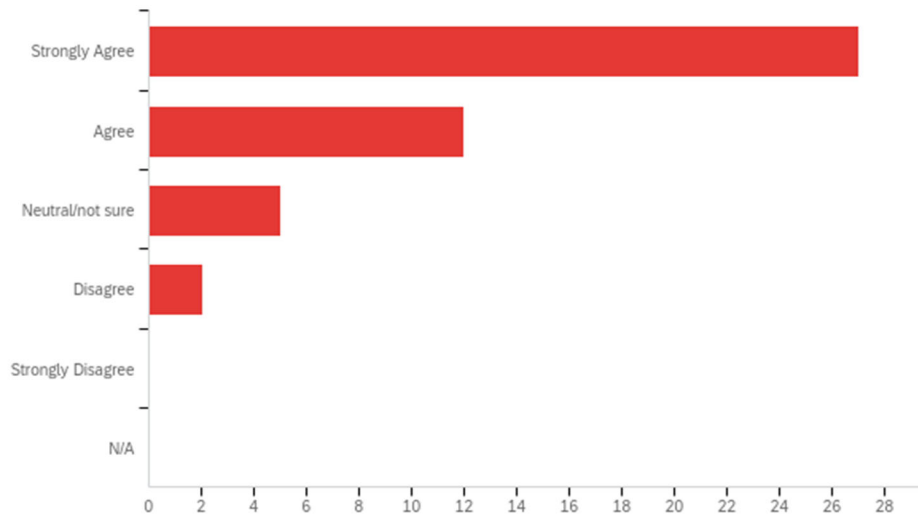ss in agreement compared to the above views, still 76 percent of respondents (n = 35) either strongly agreed or agreed that the MRTCC technologies had improved case clearances. Another 20 percent (n = 9) were unsure or neutral in that perspective, while 1 person was non-responsive (see Figure 8). The purpose of this question was simply to get respondents' perspectives, though many, particularly among patrol respondents, were unsure of case processing outcomes beyond their initial handling of the crime incidents. Because of this, and indeed consistent with all perception questions, the finding here should not be deemed as completely valid on its own. Instead, it should be used to gauge the viewpoints of those individuals who had been on the "front lines" of utilizing MRTCC technologies.

Figure 8. Perceptions of MRTCC Having Increased Case Clearances

Question: Based on your experience and if applicable, the MRTCC has increased the number of cases that have been cleared.

Figure 9. Perceptions of MRTCC Having Reduced Time to Clear Cases

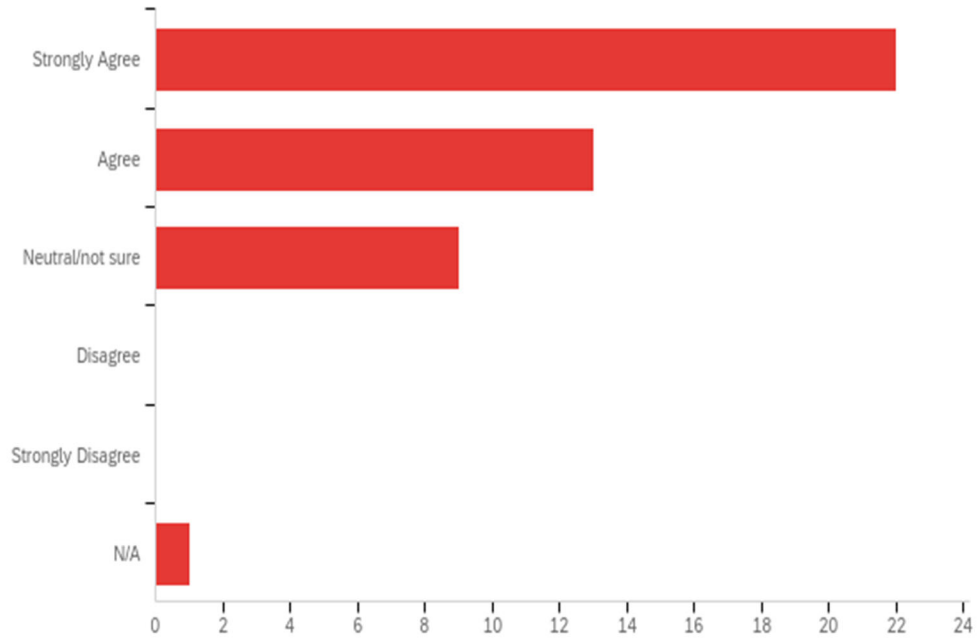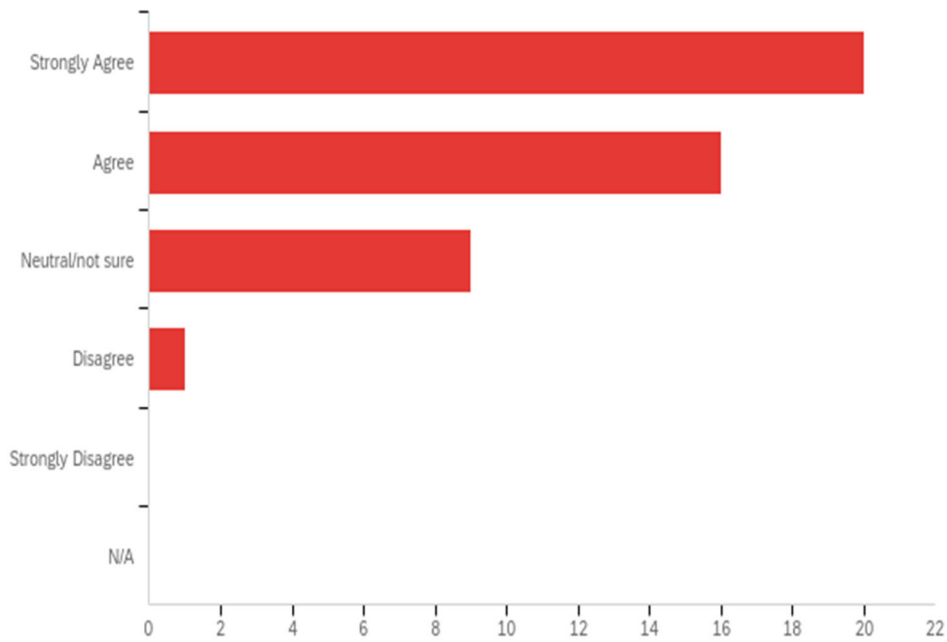
Question: Based on your experience and if applicable, the MRTCC has shortened the amount of time that it takes to clear cases.

A similar distribution was evident regarding perceptions of the amount of time that it took to clear cases (see Figure 9). Here, 78 percent of respondents (n =36) either strongly agreed or agreed with the statement that MRTCC technologies had shortened the amount of time that it took to clear cases. Similarly, 20 percent of respondents (n = 9) were unsure or neutral in this perspective, and 1 respondent (2%) disagreed that the time to clear cases had been improved by MRTCC technologies.

5. <u>The MRTCC platform is perceived to provide several other benefits to officers, detectives, and NET Commanders such as increased safety, improved efficiency, and greater situational awareness.</u>

In addition to assisting in deciphering what went on during incidents and identifying suspects, respondents also stated that the MRTCC platform provided several other benefits. A few respondents indicated that MRTCC technologies improved officer safety. This was perceived to be because officers were able to receive better information about the crime incident prior to arriving at the scene, while they were in route, and once they have arrived. This allowed officers to be better prepared to respond to the incident scene in a manner that was appropriate to what was or had actually occurred. Many respondents indicated that often information that was given by community members was incomplete or inaccurate. Having the cameras for observation and with guidance from the MRTCC detectives allowed patrol officers and detectives to be better informed. Several respondents also indicated that the MRTCC technologies provide greater efficiency and allow them to deal with scenes and conduct investigations more efficiently. One respondent indicated that the technologies allowed them to "get in front" of the crime, to have quicker responses to crime events. Some responses illustrating these viewpoints include the following:

> "Provides all needs. Can't imagine policing without it. A very necessary tool in the world we live in.
> Improvements and enhancements include speeding up information sharing when calls come in, there are

eyes on the situation immediately, and officers not coming into the situation blindly. Verifying calls, whether they are legitimate calls for service or not. Allows officers to respond more appropriately and effectively. Helps de-escalate officers. If there is something going on actively, we have eyes on the scene and appropriate responses are deployed." (NET Commander)

"Major benefit. It makes officers safer. It helps us to identify vehicles and people. I can remember without it; work was a lot harder and it's a lot easier now. Too many benefits to list. Wouldn't know how to go back to life without it. It documents evidence easier, it's quicker and efficient." (Detective)

"Provides a lot of benefits. Officer safety is one of the most important things ([gunshot detection] in particular). Allows us to know exactly where incident occurs, real-time information, evidence. Officer safety during protests." (Patrol officer)

"[It's] very beneficial. One of the best things we have out there. Very crucial for us, we can see all that happened. When we get dispatched, we are not able to see what occurred, but now we can receive information on our way to the scene or get information after the fact." (Patrol officer)

"Increases evidence to support my work and makes my work more time-efficient. We are able to pinpoint where suspects are based on information provided. MRTCC makes me safer. They are always monitoring us and ensuring the areas are clear/safe. When I am on the way to the scene it makes me feel better when they push out info on the radio." (Patrol officer)

"It gives us the ability to view cameras as crimes are happening. We are able to get "in front" of the crime. It gives us the ability to go back and helps our detectives clear crimes and incidents by arrests because of all the technologies. Makes things easier, faster, more accessible." (Patrol officer)

"MRTCC is another crime-fighting tool and like any tool, sometimes it's effective and sometimes it's not. If that doesn't work, we need to rely on other tools. Sometimes we can't receive BOLOs from MRTCC for example, so we need to rely on other tools." (Patrol officer)

"Makes everyone's life easier. For example, command staff is better able to manage large critical incidents and receive information in real-time and visually as opposed to radio communications as it used to be." (NET Commander).

6. <u>It was most consistently perceived that the MRTCC platform could be improved by expanding the technologies, particularly CCTV, to cover more operational areas 24 hours a day, and by allowing direct use of some technologies by detectives and commanders.</u>

There were two most prominent views on how the MRTCC could be improved. The first, and the one most widely agreed-upon, was that the coverage of the MRTCC technologies needed to be expanded to include more geographic areas. More CCTV cameras were the technology most referenced, but the general sentiment was also viewed for LPRs and gunshot detection systems. The second most consistent finding was predominantly held among detectives and commanders

regarding accessing the technologies that were managed within the MRTCC. Generally, both units tended to view that it would be better for them to be able to access the technologies themselves rather than requesting assistance from the MRTCC unit detectives.

The reason for this direct access differed according to the respondent's position and duties. For detectives, it would allow them to search video footage and area patterns more precisely since they were the most knowledgeable about information surrounding the case. Thus, they would be more likely to be able to identify useful pieces of evidence or investigative leads through their own retrieval and scrutiny of information than MRTCC detectives could provide since they would have only a limited understanding of the case. Detectives also thought that it would save some time if they were able to access the information directly. Some even reported feeling as if they were a burden on MRTCC detectives by taking up too much of the unit's time in conducting technology-based evidential searches. Other detectives stated that cases move so quickly that having the ability to access the technologies directly themselves would allow them to move more quickly. For commanders, the perception was that they would like to have the ability to review historical CCTV footage within their net areas. Most confirmed that they currently have direct access to observe live CCTV coverage in their areas, but they would like to be able to retrieve past footage. It was felt this would give them a better situational understanding of what was in had gone on within their areas of responsibility. The following excerpts from a selection of respondent statements illustrate these viewpoints.

> "More cameras, we have a lot of hot spots that don't have any cameras and accessing information, relay footage to us." (Patrol officer).

> "Being available around the clock, more people, and def. more cameras. Mimic New York model or be in that same playing field." (Commander)

> "Have better access to information, without going through the chain. Access information ourselves." (Detective)

"We are half in. We need to be all in. Our MRTCC should be triple the size. More officers monitoring it real-time. More cameras. More LPRS. We need to have a team aside (could be non-sworn) that creates partnerships with businesses and buildings to create buy-in to have more cameras and LPRs around the city. More private-public partnership for more coverage. (Create a tax benefit of sort, or incentivize?). We've come a long way, but we are behind as a major city in investing more into the MRTCC. We need county-wide MRTCC." (Commander)

"It would be great for Commanders to have the ability to rewind camera footage without having to go to MRTCC and create a request." (Commander)

"Not that I dislike MRTCC, but sometimes as a detective I would prefer to have access to information and not go through the unit. As a detective, I am the primary case holder and rely on MRTCC detective to understand my needs. I still have to edit the footage in terms of the storage." (Detective)

"More cameras, and cameras facing in other directions." (Patrol officer)

"More personnel. Document sharing (ex: with attorneys). Seems archaic in nature. Maybe a cloud-based system for document sharing. Improved system for disseminating information to partners (e.g., external). Ability to go live with BWCs (ex: special events). More eyes and also audio." (Detective)

"Addition of more cameras, and more SS [Shot Spotter] in different areas of the city. Cameras that are in-sync with SS [Shot Spotter]." (Patrol officer)

"More CCTV coverage, more LPRs on patrol cars and city vehicles. LPRs are great but would be more useful on patrol cars. A lot of times the LPRs on cameras do not provide enough coverage as opposed to mobile LPRs." (Detective)

Consistent with these views, a closed-ended question that asked respondents to indicate different categories in which the MRTCC could be improved revealed a distribution that further supports these two broad suggestions. Respondents were able to mark all categories that they felt applied. Presented in Figure 10, the three most prominent categories scored were more information sources, accessibility, and "other." Both "more information sources" and "accessibility" were marked as ways of improving 17 times each representing 25 percent of the responses, respectively. Together, those two categories represented half (50%) of the responses given. In this instance, the "other" category was redundant as it was utilized as an open-ended place for respondents to specify what they meant in their marking of the first five categories. The most common response in that "other" category was more CCTV coverage. Better quality of information was marked 7 times representing 10 percent of responses, better procedure was marked 5 times representing 7 percent

of the responses, and timeliness (i.e., turn-around times) was marked 4 times representing 6 percent of the responses.

Figure 10. Perceptions of How MRTCC Could Improve
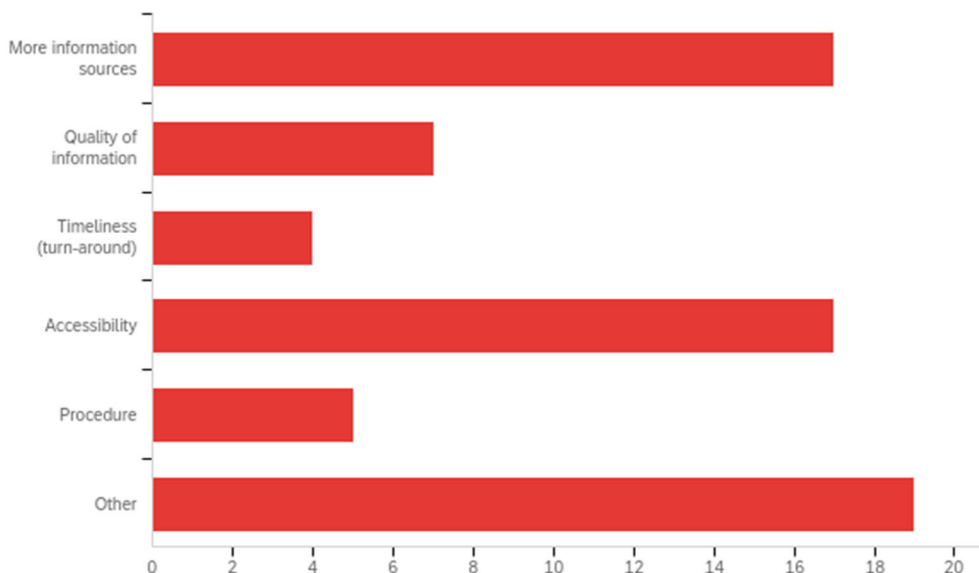
Question: In which of the following areas could the MRTCC be improved? (Check all that apply)

Part II: The Role of MRTCC Technologies within the Processing of Violent Crime Cases

The second part of the evaluation focused on determining the extent to which MRTCC technologies were incorporated into the processing of violent crime incidents and how MRTCC technologies related to other traditional components of investigative evidence. This part of the evaluation was designed to answer two specific research questions: 1) "Have MRTCC evidential technologies been integrated into the processing of cases?" and 2) "How did MRTCC evidence relate to traditional evidential components in case processing?" While the surveys of MRTCC technology users certainly indicated that they were being used, the extent to which and exactly how they related to other traditional components of investigative practice remained unclear. Several survey respondents indicated that they utilized MRTCC technologies to help understand

crime incidents when witnesses had given conflicting accounts, but to what extent were MRTCC technologies being used within the context of other traditional investigative practices such as human-based evidence (i.e., witness statements and victim statements), crime scene evidence, and warrant derived evidence?

This part of the analysis could also assist in determining whether MRTCC technologies were adopted to the extent that would justify their sustained use and functioning as a new ongoing practice within the MPD. If it were found, for instance, that MRTCC technologies comprised only a peripheral or marginal role in the processing of violent crime cases, unrelated to traditional evidence sources, then the sustainability of the MRTCC may be less justifiable. If, however, MRTCC technologies had been integrated within the processing of cases (albeit the ones they were able to assist) then the center's ongoing operation and further investment would have a stronger basis. Thus, it would be more difficult for the MRTCC to be dismantled or substantively disfigured under subsequent command structures.

Method

Analytical approach

To answer these questions a module network analysis was used to ascertain with some empirical reference the extent to which MRTCC technologies had become integrated within the investigative process. Network analysis allows for visualization of the constellation of the components typically involved in the investigation and processing of violent crime incidents to observe how they relate to one another. Social network analysis has become somewhat common in the analysis of gangs, street crime groups, and terrorist networks, however, its use to analyze the components of various criminal justice systems remains novel. While the general approach and metrics are the same, how a module network analysis is applied differs. While social network analysis identifies the centrality and position of individuals within social arrangements, a module

network analysis assists in identifying and visualizing relationships between measures and the extent to which some measures (referred to as 'nodes' in network analyses) are more central or peripheral within the conceptual components being studied. The network modules here were constructed with an EBICglasso estimation procedure with a nonparanormal transformation.

Data

This analyzed data was drawn from the expanded data set derived from the MRTCC incident log and the stratified randomly drawn control sample. The analysis utilized measures from the data set which coded whether various evidential sources were used in the investigation of the violent crime incident regardless of whether usable evidence was obtained from the evidence sources. This is because the purpose of the analysis here was to determine how these various evidence sources were being used by officers and detectives, exclusive of whether they yielded usable evidence for prosecutorial purposes. These evidence sources were grouped into four types and included MRTCC technologies (CCTV, LPR, social media, facial recognition, and Shotspotter), crime scene evidence (NIBIN, GSR, CSI, Latents/DNA), human-based evidence (victim interviews, witness interviews, media flyers, suspect lineups, and private CCTV systems[7]) and warrant based evidence (search warrants, cell warrants). For more detail on how these data sources were constructed, see the previous section on "Data and Intelligence."

Findings

Table 7 presents an overview of the distribution of evidential nodes present in both samples of cases, those that were assisted by MRTCC technologies and those from the control sample which did not receive MRTCC support. For the most part, the various evidential sources were

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[7] Private CCTV systems were coded as human based as they were retrieved from community members own private CCTV systems rather than MPD MRTCC camera systems.

utilized similarly within both groups by MPD officers and detectives, although with a few exceptions. Notably, public information flyers were used significantly less in the control sample (10% vs. 33%, respectively) as was the presence of external CCTV evidence (12% in control vs. 49% in MRTCC sample). Lineups were also used significantly more in the MRTCC sample (22%) compared to the control sample (17%). Similarly, within crime scene evidence gunshot residue evidence was used about half as much in the control sample compared to the MRTCC sample (5% vs. 12%, respectively) and ballistics tracing through NIBIN was also used much less in the control sample compared to the MRTCC sample of cases (9% vs. 30%, respectively). The use of the Crime Scene Investigation unit was also used significantly more in MRTCC cases compared to the control sample (54% vs. 38%, respectively) Finally, warrant-based evidence was used about three times as often in MRTCC samples compared to the control cases with search warrants at 8 percent for MRTCC cases and 2 percent for control and cell warrants at 6 percent for MRTCC cases and 2 percent among control cases. Presumably, these differences are attributable to the fact that MRTCC technologies provide officers and detectives with evidential information that allows them to initiate other evidential collection efforts. For instance, it is plausible that both the creation of public flyers and obtaining warrant-based evidence as the next step within the investigative process would be facilitated more readily by the presence of MRTCC information technology evidence.

Beyond these distributions, the findings from the network analysis indicate several important things. First, the network of MRTCC-supported cases and the randomly drawn control cases had similar levels of sparsity within the network. As reported at the bottom of Table 7, the MRTCC-assisted sample had a sparsity measure of .525 compared to that of .491 of the control sample. The sparsity measure determines the difference between a complete network where all nodes have a relationship with one another, and the number of relationships observed in the

analyzed network. Thus, the lower the sparsity metric the greater the interconnectedness of the nodes within the network model as they are closer to a completely connected network. Conversely, the higher the sparsity metric the lower the connectivity between the evidential nodes as the deviation from a fully connected network is greater. Despite the greater number of evidential nodes present in the MRTCC network, the level of connectedness with other evidential nodes remains about the same as in the control sample. This indicates that the MRTCC technologies have been equally integrated into case processing in a manner proportionate to other evidential nodes.

Table 7. Distribution of Evidential Nodes Present in MRTCC-Assisted and Control Cases (N = 1,296)

| Measure nodes	MRTCC-assisted cases n (%)	Control cases n (%)
MRTCC technologies		
CCTV	564 (87%)	--
Social media	120 (19%)	--
Facial recognition	165 (26%)	--
Shotspotter	125 (19%)	--
License plate reader (LPR)	82 (13%)	--
Human evidence		
Victim interview	585 (90%)	590 (91%)
Witness interview	234 (36%)	200 (31%)
Lineup*	145 (22%)	109 (17%)
Flyer***	213 (33%)	63 (10%)
External CCTV***	314 (49%)	79 (12%)
Crime scene evidence		
Gunshot residue (GSR)***	80 (12%)	31 (5%)
Latent prints/DNA	149 (23%)	175 (27%)
Crime Scene Investigation (CSI)***	350 (54%)	246 (38%)
Ballistics tracing (NIBIN)***	193 (30%)	57 (9%)
Warrant evidence		
Search warrant***	51 (8%)	15 (2%)
Cell warrant***	39 (6%)	12 (2%)
	N = 648	N = 648
Network Summary		
Nodes	16	11
Non-zero edges	57/120	28/55
Sparsity	.525	.491

$*p \leq .05, **p \leq .01, ***p \leq .001$; Fisher's Exact Test used to determine differences between the samples for these dichotomous measures.

This augments the survey findings that the MRTCC technologies add to officers' and detectives' abilities to develop and utilize evidential leads in their response to violent crime cases. The MRTCC technologies are not being used *instead* of other evidential sources, rather they are being used *in conjunction* with traditional evidence sources. Moreover, they are just as integrated with their use with traditional evidence nodes as traditional evidence nodes are among each other. More comprehensive use of multiple evidence sources increases investigators' and officers' ability to triangulate information to ensure the validity of case information and determine appropriate subsequent actions. In so far as the information obtained during the investigation of MRTCC-assisted cases is more valid and reliable, it should result in fewer false positives and false negatives in the adjudication of violent crime cases.

Second, MRTCC technologies appear to occupy a substantial role in the processing of cases in some instances to a greater extent than traditional evidential sources. Presented in Figures 11 and 12, the MRTCC evidence nodes appear to have many connections with other evidence sources. Three of the MRTCC evidence sources, CCTV, social media, and facial recognition, have moderate to high betweenness centrality measures comparable to the other traditional evidential nodes within the network (see Figure 12). Betweenness centrality measures the number of times that a node falls along the shortest path between other nodes. The higher the value, the more connected it is to other network node paths. In this case, the high betweenness of facial recognition suggests that it is used most with other evidence sources to a similar extent as flyers, ballistics processing, and CSI units. Moreover, several of the MRTCC evidence nodes (CCTV, facial recognition, and social media) had consistently moderate to high measures of degree centrality and closeness centrality. Degree centrality measures the number of nodes that a given node is connected to while closeness centrality measures how close a given node lies in reference to other

nodes within the network. Taken together, MRTCC evidence sources (nodes) appear to have become an integral part of the processing of violent crime cases.

Figure 11. Module Network of MRTCC-assisted Violent Crime Incidents
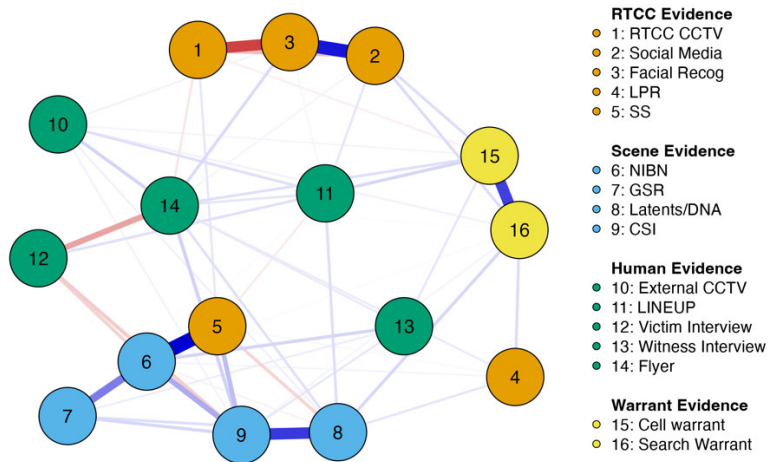
Figure 12. Centrality Plots of MRTCC-assisted Violent Crime Incidents
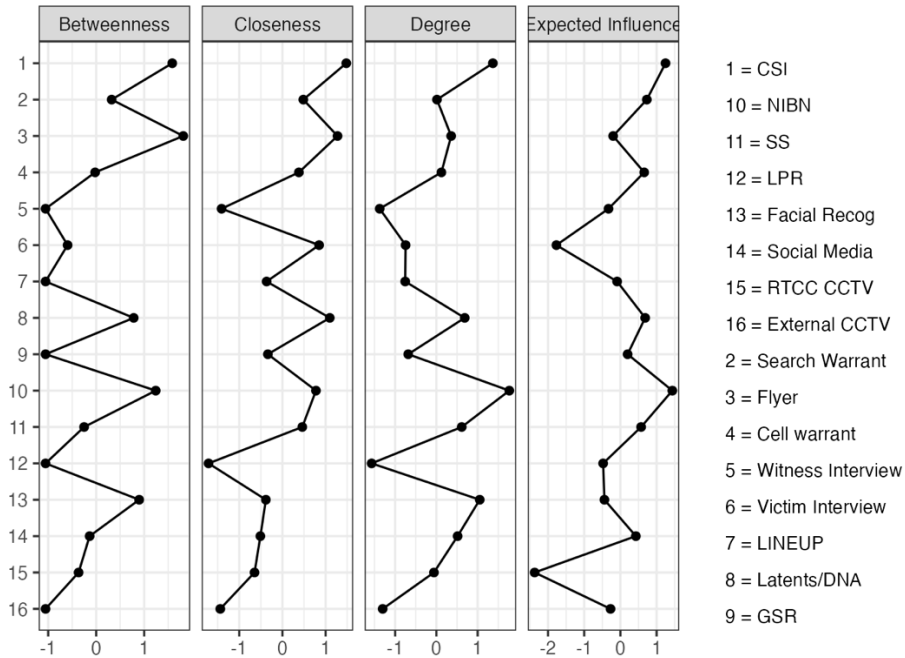
Within the control sample, the victim interview occupies the most central evidence node among cases with no MRTCC support (see Figures 13 and 14). In those cases, the victim interview exhibits the highest betweenness, closeness, and degree centrality measurements (Figure 14). In the control network, the central role of the victim interview is also visible in the component arrangement (Figure 13). In these cases, the victim interview appears to stand as the single most influential node of evidence in the assembling of evidence for case processing. Considering the mutability of human testimony and the common reluctance of victim participation in adjudication processes more generally, the reliance on this single evidence source to develop cases is likely to be much more problematic compared to those with the benefit of MRTCC evidential support where the number and relationship between numerous evidential sources are greater.

Figure 13. Module Network of Control Sample Violent Crime Incidents
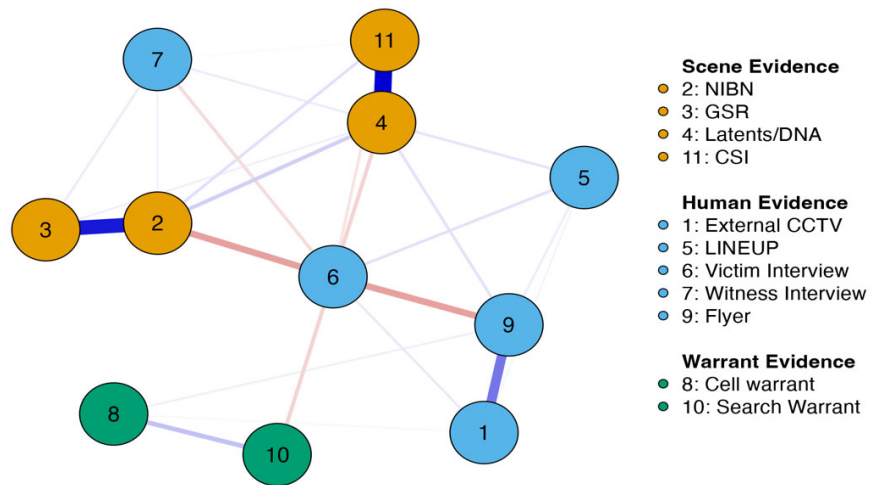
Figure 14. Centrality Plots of Control Sample Violent Crime Incidents

1 = CSI
10 = NIBN
11 = External CCTV
2 = Search Warrant
3 = Flyer
4 = Cell warrant
5 = Witness Interview
6 = Victim Interview
7 = LINEUP
8 = Latents/DNA
9 = GSR
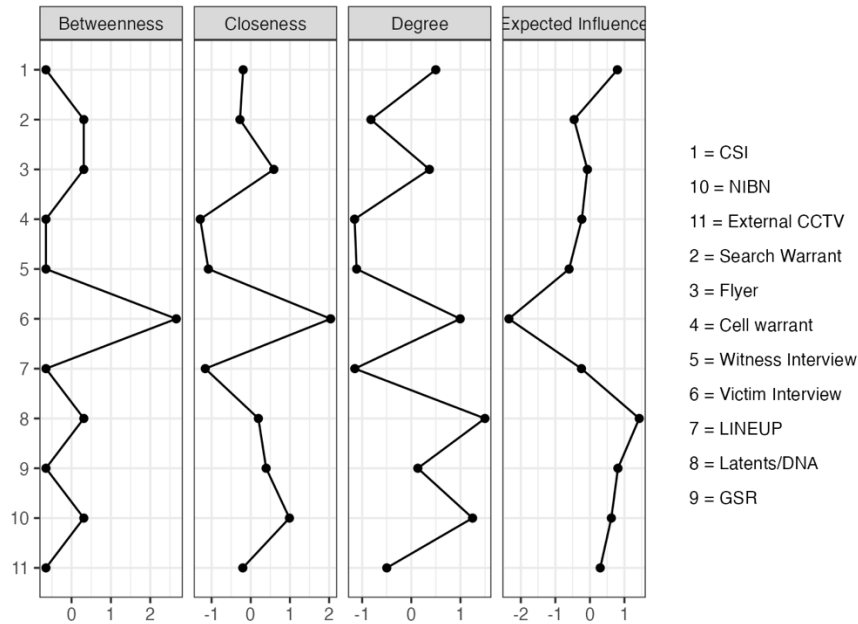
A third finding from the network analysis is that some evidential nodes are more strongly associated with specific nodes than others. For instance, the strongest components of the MRTCC evidential nodes were CCTV, social media, and facial recognition. These nodes were also high in closeness to one another (see Figure 11). This suggests that the development of real-time technologies might best be implemented in tandem to receive the full benefit of real-time crime center technologies. For instance, if an RTCC was only capable of CCTV monitoring without social media or facial recognition search capabilities, then the usefulness of the RTCC platform to clear cases might be more limited. This finding offers important implications for other agencies working to create their own RTCC.

Part III: Impact of MRTCC on Violent Crime Case Outcomes

The third part of the evaluation focused on determining whether violent crime cases assisted by MRTCC information technologies improved the outcomes of those cases. Specifically,

this part of the analysis sought to understand whether MRTCC-assisted cases resulted in better rates of case clearances and whether the time that it took to clear those cases was reduced. The analysis focused on answering two research questions: 1) "Did MRTCC-assisted violent crime incidents have greater rates of case clearance compared to violent crime cases that did not receive MRTCC support?" and 2) "Did MRTCC assistance on violent crime cases shorten the amount of time that it took to clear those cases compared to violent crime incidents that did not receive MRTCC assistance?" The qualitative surveys clearly found that MRTCC users perceived that these technologies did improve the ability to clear cases and shortened the amount of time required to do so. This part of the evaluation sought to empirically and objectively determine whether that was true using a sound research design with high methodological rigor.

Intuitively, increasing the number of evidential sources used in response to violent crime incidents, such as the information technologies that exist within the MRTCC platform, should improve the ability to identify offenders and thereby increase the ability to clear cases. The only previous evaluation of the real-time crime centers in Chicago assessed the impact of the technologies on overall crime rates within the communities where they were deployed finding that crime was reduced in RTCC targeted areas (Hollywood et al., 2019).[8] In the current evaluation, assessing the impact of the MRTCC on rates and levels of violent crime in the community was not appropriate for two reasons. First, in Miami, the RTCC was launched at the beginning of the project term and was very much in developmental phases throughout much of the period of study. Because of this, the MRTCC was not deployed sufficiently to result in reduced violent crime levels across entire neighborhood areas of the city. Second, the deployment of MRTCC technologies in Miami was for the most part incident based. The deployment of MRTCC resources was carried

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[8] The Chicago Police Department maintains several decentralized RTCCs that are housed within community neighborhood areas as opposed to one centralized MRTCC like that of Miami.

out either during the response to specific calls for service or during the investigation of those incidents. Because of this incident-driven application of the MRTCC technologies, it was most appropriate to evaluate the impact of the MRTCC on case processing and outcomes. In Chicago, the RTCCs were reported to have been used more centrally within a community-based, problem-solving approach which made assessing their impact on crime problems in those neighborhood communities more appropriate.

Method

Analytical approach

To determine whether MRTCC-assisted violent crime incidents had better chances of being cleared and a shorter time to clearance, several analytical approaches were used. First, a series of nested multivariate logistic regression models were used to determine the odds of case clearance for MRTCC cases compared to a randomly drawn sample of violent crime cases which did not receive MRTCC support. The multivariate model adjusted for various violent crime incident characteristics which could potentially influence the clearance likelihood of cases outside the scope of MRTCC technologies. Second, a Kaplan Meier survival analysis with hazard model outputs was used to determine differences in the time to case clearance for MRTCC-assisted cases compared to the control sample. Third, to adjust for circumstantial differences across violent crime cases a Cox proportional hazards regression model was also run to determine trajectories in the time to case clearance between MRTCC-assisted cases and the control sample while adjusting for differences in case circumstances that could impact the time-to-case clearance.

Data

The analysis relied on data from the expanded MRTCC incident log analytical database which contained additional measures of violent crime incident characteristics and sources of evidence used by responding officers and detectives. These measures included victim

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characteristics (victim age, sex, and race), human-based evidence sources (the presence of a victim interview, witness interview, lineup, public flyer, or the presence of a civilian-owned CCTV system), crime scene evidence (whether a gun or vehicle was used, gunshot residue was searched for, Latent prints or DNA were searched for, the crime scene investigation (CSI) team was deployed, and whether ballistics tracing via NIBIN was undertaken), and warrant evidence and manpower used (whether a search warrant was issued, a cell warrant was issued, and the number of officers who worked on the case). All but two of these measures were coded dichotomously with 1, indicating they were present within the investigation of the case and 0 indicating their absence. Two measures, victim age and number of officers responding, were coded as continuous measures. There were two dependent measures in the outcome analysis, whether the case was cleared by arrest (coded as 1 indicating an arrest was made and 0 one was not) and the number of days from the time the incident occurred to the time the arrest was made. Days to arrest was coded as a continuous measure.

The randomly drawn control data was also used to compare differences in these outcomes across the two samples while adjusting for violent crime incident characteristics.[9] The control sample was stratified by NET area and violent crime type proportionate to that represented in the MRTCC incident log and the expanded analytical database. This random selection within the stratifications resulted in equivalency between the two samples based on those two stratifications as reported in Appendix C. There were no significant differences between the two in terms of the number of incidents occurring in the respective NET areas nor the number of violent crime incident types. Having proportionate numbers of incidents occurring within specific NET areas and incident types should ensure that neighborhood effects (usually measured by neighborhood demographics)

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[9] Refer to the previous "Data and Intelligence" section for more information on these data.

were equivalent in the samples. The control sample included the same dependent measures and incident characteristic measures that were recorded in the MRTCC expanded analytical database and were coded in the exact same manner. For more information on the collection and assembly of each of the data sources refer to the previous "Data and Intelligence" section of this report.

Table 8. Characteristics of MRTCC-Assisted Cases (N = 648)

Measure	Frequency	Percent[1]
MRTCC Technologies		
CCTV	564	87%
Social media	120	19%
Facial recognition	165	26%
License Plate Readers (LPR)	82	13%
Shotspotter (SS)	125	19%
Crime types		
Homicide	62	10%
Aggravated assault	232	36%
Assault	53	8%
Sexual assault	23	4%
Domestic violence	45	7%
Robbery	233	36%
Neighborhood Areas		
Allapattah	77	12%
Brickell	12	2%
Coconut Grove	11	2%
Coral way	8	1%
Downtown	73	11%
Edgewater	10	2%
Flagami	20	3%
Little Haiti	103	16%
Little Havana	42	7%
Model city	100	15%
Overtown	124	19%
Upper East Side	8	1%
Wynwood	60	9%

1. May not equal 100 due to rounding.

Table 8 provides the characteristics of the cases in the MRTCC-assisted sample. In total, there were N = 648 cases. The most utilized technology was by far CCTV systems which were used in 564 cases representing 87 percent of cases in the sample. This was followed by facial recognition which was used in 165 cases (26%) and the Shotspotter gunshot detection system

which was used in 125 of the cases (19%). The next most common technology used was social media in 120 cases (19%) followed lastly by license plate readers (LPR) which were used in 82 cases (13%). The most common crime type was bimodal, with aggravated assault and robbery being most common with 232 and 233 (36%), respectively. The next most common violent crime type represented in the sample was homicide at 62 (10%) followed closely by assault with 53 cases (8%) domestic violence with 45 cases (7%) and lastly sexual assault with 23 cases (4%). Among neighborhood areas, the one with the most incidents within the MRTCC sample was Overtown with 124 cases (19%), followed by Little Haiti with 103 cases (16%) and Model City with 100 cases (15%). The next most active neighborhoods were Allapattah with 77 cases (12%), Downtown with 73 cases (11%), Wynwood with 60 cases (9%), and Little Havana with 42 cases (7%). The net areas with the fewest cases included Flagami with 20 (3%) Brickell with 12 (2%), Coconut Grove with 11 (2%), and Coral Way and the Upper East side each with 8 cases each (1%).

Findings

Table 9 provides a comparative overview of the measures used in the analysis for both the MRTCC-assisted sample and the randomly drawn control sample. For the two outcome measures, a significantly greater proportion of cases were cleared within the MRTCC-assisted sample (N = 234, 36 percent) compared to the control sample with only 198 cleared cases (31%). Alternatively, MRTCC-assisted cases had a significantly longer time to clearance with an average of 43 days to case clearance (SD = 112.4) compared to the control sample average of just 19 days (SD = 54.5). Among the measures used in the analysis to adjust for victim and crime investigation characteristics, there were several significant differences between the two samples. Among victim characteristics both victim age and whether the victim was black were significantly different although in frequency the differences were small. The MRTCC-assisted sample had an average

victim age of 36 (SD = 14.4) while the control sample was slightly older with an average victim age of 38 (SD = 16.1). Among the MRTCC sample, roughly half of the victims were black (n = 322) while 45 percent of the control sample victims were black (n = 290).

Table 9. Comparative Overview of Measures Used in the Analysis

N = 1,296	MRTCC-Assisted Cases n = 648		Control Cases n = 648	
Measures	**Mean (SD)**	**N (%)**	**Mean (SD)**	**N (%)**
Cleared*[2]	--	234 (36%)	--	198 (31%)
Days to clearance**[1]	43 (112.4)	--	19 (54.5)	--
Victim characteristics				
Victim age**[1]	36 (14.4)	--	38 (16.1)	--
Victim male	--	428 (66%)	--	410 (63%)
Victim black*[2]	--	322 (50%)	--	290 (45%)
Human evidence				
Victim interview	--	585 (90%)	--	590 (91%)
Witness interview	--	234 (36%)	--	200 (31%)
Lineup*[2]	--	145 (22%)	--	109 (17%)
Flyer***[2]	--	213 (33%)	--	63 (10%)
External CCTV***[2]	--	314 (49%)	--	79 (12%)
Crime scene evidence				
Gun used***[2]	--	337 (52%)	--	218 (34%)
Vehicle used***[2]	--	377 (58%)	--	210 (32%)
Gunshot residue (GSR)***[2]	--	80 (12%)	--	31 (5%)
Latent prints/DNA	--	149 (23%)	--	175 (27%)
Crime Scene Investigation (CSI)***[2]	--	350 (54%)	--	246 (38%)
Ballistics tracing (NIBIN)***[2]	--	193 (30%)	--	57 (9%)
Warrant evidence & manpower				
Search warrant***[2]	--	51 (8%)	--	15 (2%)
Cell warrant***[2]	--	39 (6%)	--	12 (2%)
Number of officers**[1]	4.06 (1.87)	--	3.82 (1.34)	--

$*p \leq .05$, $**p \leq .01$, $***p \leq .001$; [1] For these measures, independent samples t-tests were used to determine differences, equal variances not assumed. [2] Fisher's Exact Test was used to determine differences for these dichotomous measures.

Within the measures comprising human evidence, three of the five were significantly different between the two groups. There were statistically significant greater proportions of lineups (n = 145 vs. n = 109) and flyers (n = 213 vs. n = 63) used and the presence of external CCTV

evidence (n = 314 vs. n = 79) within MRTCC-assisted cases compared to the control sample. There were no significant differences in the presence of victim and witness interviews. For crime scene-based evidence five of the six measures were significantly different between the samples. There were significantly more guns present (n = 337 vs. n = 218) and vehicles used (n = 377 vs. n = 210) in the commission of a crime, and accordingly more processing of gunshot residue (n = 80 vs. n = 31), greater use of the CSI unit (n = 350 vs. n = 246), and greater use of NIBIN ballistics tracing (n = 193 vs. n = 57). Lastly, there were also significantly greater numbers of search warrants (n = 51 vs. n = 15) and cell warrants (n = 39 vs. n = 12) used, and more officers utilized (mean = 4.06 vs. mean = 3.82) on MRTCC-assisted cases compared to the control sample.

The analysis to determine whether MRTCC-assisted cases had greater odds of being cleared is reported in Table 10. While the statistics reported in Table 9 indicated that MRTCC-assisted cases were cleared with greater frequency, those numbers alone do not account for the differences in case processing between the two samples which were also evident and reported in Table 9. The multivariate logistic regression analysis adjusts for the influence of those differences in determining more accurately the role of MRTCC technologies in the clearance of violent crime cases. Here the multivariate logistic regression analyses consistently show that MRTCC-assisted cases exhibit significantly greater odds of being cleared even after accounting for the influence of victim characteristics and case processing characteristics.

As reported in the first row of Table 10, the odds ratio for MRTCC-assisted cases exhibited increasingly greater clearance odds after adjusting for each component of case characteristics across the four models. In model 1 MRTCC-assisted cases were associated with 39 percent greater odds (OR = 1.386) of being cleared compared to the control cases while holding victim characteristics constant. In model 2 those odds improved, where MRTCC-assisted cases exhibited

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48 percent greater odds (OR = 1.482) of being cleared compared to control cases while accounting for the presence of the human-based forms of evidence. In model 3 crime scene evidence is accounted for in the model and again we see significantly greater odds of MRTCC cases being cleared compared control cases with an improvement of 68 percent (OR = 1.676). Finally, after accounting for the influence of warrants and accounting for the number of officers used in the case, MRTCC-assisted cases continued to exhibit 66 percent greater odds (OR = 1.658) of being cleared compared to cases that did not receive MRTCC support.

Among all independent measures that were significantly related to case clearance, once they were entered into the analysis, they continued to be significant throughout subsequent models. Among victim characteristics, only one measure, whether the victim was male was significantly related to whether a case was cleared. Here when the victim was male the odds of the crime being cleared were significantly reduced. Among the human evidence measures, four of the five were significant predictors of case clearance. The presence of a witness interview, a lineup, and the distribution of a suspect flyer were all significantly related to greater odds of the case being cleared. Of these, the most impactful was the presence of a suspect lineup and among those cases the odds of the case being cleared were five times greater than when no lineup occurred, holding all else constant. The presence of an external CCTV system in the vicinity of a crime was related to lower odds that the case would be cleared. Among the crime scene measures, only two were significantly related. In crimes where a gun was used or a vehicle was involved, the odds of the case being cleared were significantly less. Finally, when a search warrant or cell warrant was present in the investigation of a case, the odds of the case being cleared were two times greater than when they were not present, considering all other case characteristics.

Table 10. Multivariate Logistic Regression of Predictors of Case Clearance among MRTCC-Assisted and Control Sample

N = 1,225 Measures	Model 1 B (Odds ratio)	Model 2 B (Odds ratio)	Model 3 B (Odds ratio)	Model 4 B (Odds ratio)
MRTCC-assisted cases	.327 (1.386)**	.393 (1.482)**	.517 (1.676)***	.506 (1.658)***
Victim characteristics				
Victim age	-.002 (.998)	.002 (1.002)	-.001 (.999)	-.001 (.999)
Victim male	-.411 (.663)***	-.408 (.665)**	-.301 (.740)*	-.313 (.731)*
Victim black	-.011 (.989)	.029 (1.030)	.105 (1.111)	.120 (1.127)
Human evidence				
Victim interview		.474 (1.607)	.328 (1.388)	.352 (1.422)
Witness interview		.464 (1.591)***	.486 (1.626)***	.460 (1.584)**
Lineup		1.676 (5.344)***	1.709 (5.524)***	1.687 (5.401)***
Flyer		.593 (1.809)***	.685 (1.984)***	.624 (1.866)***
External CCTV		-.854 (.426)***	-.801 (.449)***	-.892 (.410)***
Crime scene evidence				
Gun used			-.633 (.531)***	-.654 (.520)***
Vehicle used			-.303 (.738)*	-.378 (.685)*
Gunshot residue (GSR)			.077 (1.081)	.026 (1.027)
Latent prints/DNA			.041 (1.042)	-.056 (.945)
Crime Scene Investigation (CSI)			-.200 (.819)	-.217 (.805)
Ballistics tracing (NIBIN)			.188 (1.207)	.184 (1.202)
Warrant evidence & manpower				
Search warrant				.868 (2.382)**
Cell warrant				.857 (2.355)*
Number of officers				.043 (1.044)
Model Chi-Square	17.503**	176.665***	205.134***	224.957***
-2 Log likelihood	1544.257	1385.095	1356.626	1336.803
Nagelkerke Pseudo R-square	.020	.186	.214	.233
Constant	-.687 (.503)***			

*$p \leq .05$, **$p \leq .01$, ***$p \leq .00$

The Chi-square and -2 log-likelihood coefficients suggested all 4 models were statistically significant indicating good model fit, and Nagelkerke pseudo R-square indicated an increasing ability of the models to predict the model variance ranging from a low of two percent in model 1 to a high of twenty-three percent in model 4. All independent measures used in these models were examined for multicollinearity using the variance inflation factor (VIF) with no multicollinearity revealed. All VIF factors ranged from a low of 1.079 to the highest at 1.885.[10]

The analyses to determine whether MRTCC-assisted cases improved the time that it took to clear cases are reported in Figures 15 and 16, and Table 11. The simple frequency of days to case clearance reported in Table 9 suggests that MRTCC assistance did not improve the speed at which arrests were made in violent crimes. However, this does not account for the various victim characteristics and case processing characteristics that could influence the speed at which cases are cleared which are outside the scope of MRTCC influence.

**Figure 15. Cumulative Rate of Case Clearance MRTCC vs. Control Sample**

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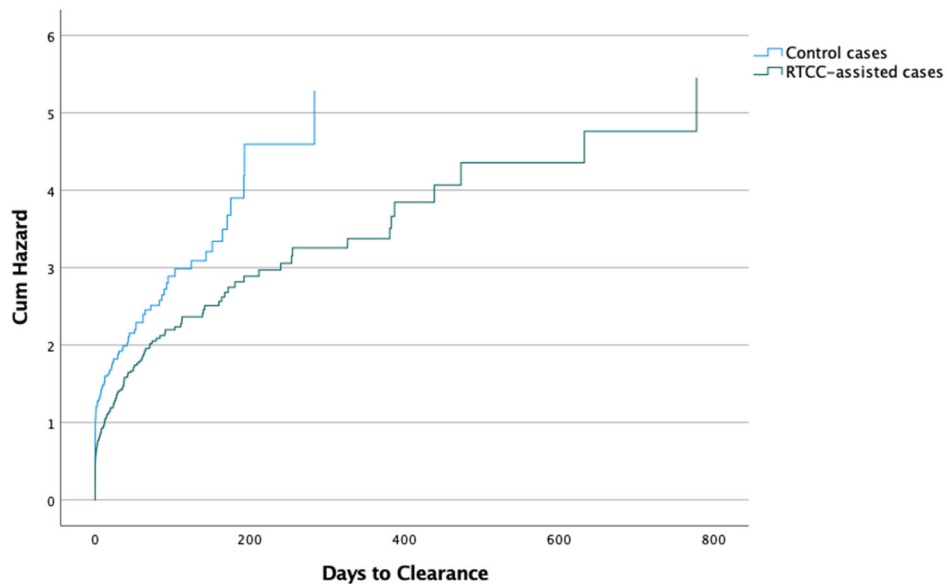
[10] These scores are far below the area of concern for VIF where convention dictates that scores of 5 or greater suggest the presence of multi-collinearity among independent measures.

It may be possible that when accounting for fundamental differences that exist within different crime cases, the difference in the time that it takes to clear cases is adjusted. To determine this, first, a Kaplan-Meier survival analysis was performed to identify the trajectories in the time-to-case clearance within the two samples. The outcome of that analysis is reported in Figure 15. This analysis does not adjust for case characteristics and only plots the proportion of cases cleared within each sample across the period of days present within the observation period. Here we see a clear difference in the trajectory of MRTCC-assisted cases and the control sample with control sample cases being cleared at a much quicker rate than those which were assisted by MRTCC technologies. The Mantel-Cox Log Rank comparison indicates that these trends were significantly different ($\chi^2 = 16.564$, 1 df, $p = .000$).

To account for differences in victim and case processing characteristics between the two samples a Cox Proportional Hazard regression model was fitted. The trend line comparison of that model is presented in Figure 16 and the measures included in that model and coefficients are reported in Table 11. Each of the victim characteristics, human evidence, crime scene evidence, warrants, and manpower measures were included to account for their influence on the time taken to clear cases. As visible in Figure 16, after controlling for case characteristics the trend lines indicating the occurrence of case clearance over time overlap and largely exhibit the same trajectory. With this adjustment, there were no apparent differences between the MRTCC-assisted cases and the control sample in the time-to-case clearance trajectories. This was also evident in the coefficients (see Table 11). Holding constant the influence of all other measures there was no significant difference in the days to case clearance between the MRTCC-assisted cases and the control sample (B = -.076, SE = .119, p = .524, n.s.). The findings here suggest that the implementation of MRTCC information technologies in the investigation of cases has not reduced

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the amount of time that it takes to clear cases, but once case-level circumstances are taken into consideration, the use of MRTCC technologies does not prolong the time that it takes to clear cases either.

Figure 16. Cumulative Rate of Case Clearance MRTCC vs Control Sample Adjusted at Mean for Case Characteristics
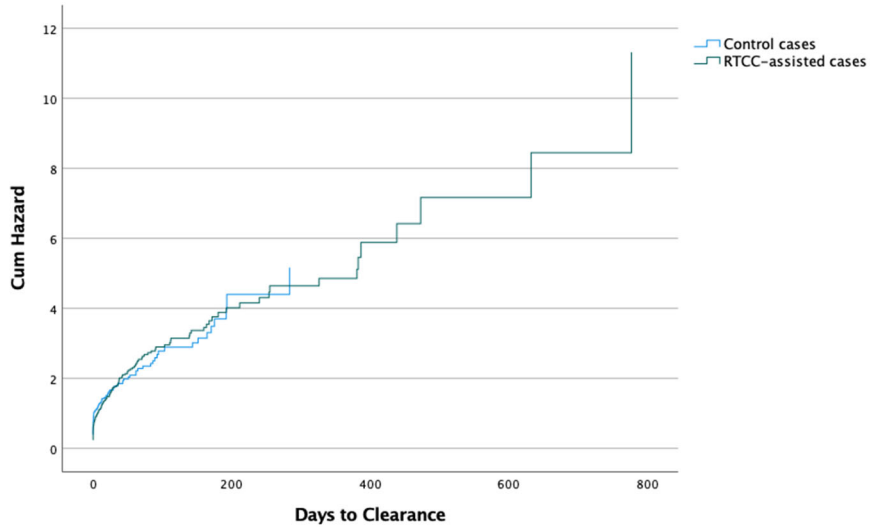
Among the remaining measures in the analysis, six were significantly related to the time that it took to clear cases. Among victim characteristics, the only significant predictor was whether the victim was male. When the victim was male the case had significantly greater odds (OR = 1.615) of being cleared before female victims. Among human evidence measures, whether a lineup or a suspect flyer was used was associated with a 23 percent (OR = .768) and 40 percent (OD = .601) lower odds, respectively, of being cleared before those cases without a lineup or flyer. For crime scene evidence measures, when a gun or vehicle was used in the commission of the crime the odds of it being cleared before those cases without a gun or vehicle were significantly less (OR = .678 and OR = .783, respectively). Finally, cases that had a cell warrant issued had significantly lower odds (OR = .600) of being cleared sooner than those without a cell warrant. The -2 log-

likelihood model Chi-Square coefficient was statistically significant indicating a good model fit

(χ^2 = 77.880, 18 df, p = .000).

Table 11. Cox Proportional Hazard Model Coefficients Predicting Days to Clearance

Measures N = 1,296	B (SE)	Odds Ratio	*P* - value
MRTCC-assisted cases	-.076 (.119)	.927	.524
Victim characteristics			
Victim age	.000 (.004)	1.000	.959
Victim male	.479 (.119)	1.615	.000***
Victim black	-.087 (.105)	.917	.407
Human evidence			
Victim interview	.409 (.238)	1.506	.085
Witness interview	.085 (.107)	1.089	.424
Lineup	-.264 (.115)	.768	.021*
Flyer	-.509 (.145)	.601	.000***
External CCTV	-.182 (.139)	.834	.191
Crime scene evidence			
Gun used	-.388 (.142)	.678	.006**
Vehicle used	-.244 (.116)	.783	.036*
Gunshot residue (GSR)	.311 (.217)	1.365	.152
Latent prints/DNA	.126 (.154)	1.134	.414
Crime Scene Investigation (CSI)	.016 (.145)	1.016	.910
Ballistics tracing (NIBIN)	.110 (.182)	1.116	.546
Warrant evidence & manpower			
Search warrant	.301 (.225)	1.352	.181
Cell warrant	-.511 (.234)	.600	.029*
Number of officers	.032 (.038)	1.032	.398
Model Chi-Square		77.880***	
-2 Log likelihood		4082.191	

*$p \leq$ .05, **$p \leq$ .01, ***$p \leq$ .001

Integration and Sustainability

There are several indications that the information technologies deployed within the real-time crime center unit have become fully integrated into the daily practices of officers, detectives, and NET commanders. First, in the qualitative surveys (part I of the evaluation), the large majority of respondents clearly indicated that the use of these technologies had become common practice and a "standard procedure" in responding to violent crime incidents. It was evident that the technologies had become integral in how patrol officers ascertained what was happening at the scene as they approached or what had happened after arriving on location. This information was regularly either pushed out to responding patrol officers by monitoring MRTCC detectives or routinely requested by patrol officers from the incident location. It was also evident among responses by detectives who were surveyed that MRTCC technologies had become a regular part of collecting and documenting evidence and identifying suspects in the investigation of cases. Beyond this many of the survey respondents indicated that they couldn't imagine doing their jobs without the benefit of MRTCC technologies. None of those surveys suggested that they would be better off without MRTCC support. On the contrary, all the comments offered to improve the real-time crime center largely focused on expanding its coverage both geographically and across time shifts as well as accelerating or improving access to those technologies.

Second, the module network analysis of investigative components reported in the part II section of the evaluation clearly indicated that MRTCC technologies had been utilized to a similar extent and in combination with both traditional human sources of evidence and forensic crime scene evidence. In that analysis, it was clear that MRTCC technologies were both strongly related to those other forms of evidence and had also risen to an equivalent level of integration as these

other forms of evidence. This indicates that the MRTCC technologies have become a fundamental part of violent crime case processing within the Miami Police Department.

The operation of Miami's MRTCC also appears to be highly sustainable. In the development of the MRTCC, the allocation of personnel to the unit were full-time appointments with funding from ongoing operational allocations. None of the personnel, beyond the graduate research assistant, were dependent on funding from grants or other temporary revenue sources. Additionally, the procurement of the technological equipment to such a large extent within the MRTCC makes it exceedingly difficult to not continue utilizing them as resources in the processing of cases. The likelihood of their continued use is even greater considering the positive publicity that the MRTCC has received in several anecdotal cases that were showcased in the local media on the ability of the MRTCC to clear several incidents in rapid time frames within the city (Fox, 2022; Ramos, 2021; Solomon & Finnie, 2021; White, 2021). At least in part, that positive publicity has helped to justify the MPD's recent request for additional reoccurring funding from the city to support ongoing and expanded MRTCC operations. Finally, the positive findings reported in this evaluation, that the MRTCC technologies have been substantially integrated into everyday practice, and that the technologies greatly improved the odds of case clearances, give even further justification for the permanent deployment of the MRTCC.

Summary and Conclusions

The Miami Real Time Crime Center violence response initiative was intended and effectively accomplished, to develop a formidable, centralized platform within the MPD to harness and deploy a host of information technologies to officers, detectives, and NET commanders in real-time to improve responses to violent crime incidents. By the close of the project term, the MRTCC unit was close to operating 582 Cameras, with the capability to access a wide assortment of information technology resources, operated with 9 full-time personnel, and provided coverage for 86 percent of weekly hours. During the three-year project term, the MRTCC unit supported 648 violent crime incidents.

A three-part evaluation of the MRTCC initiative found that the MRTCC was perceived to provide multiple benefits in responding to violent crime incidents, had become firmly integrated into case processing, and effectively increased the ability to clear cases. Those utilizing MRTCC technologies widely perceived them to be easily accessible and useful, and to have become integral to their work. Patrol officers viewed the technologies as assisting in their ability to better understand what was happening at incident locations before their arrival and to determine what had occurred once they were on the scene. Officers also perceived the MRTCC technologies to improve officer safety as they were better informed of the incident circumstances upon arrival. Detectives widely viewed MRTCC technologies as indispensable in documenting and assembling evidence and assisting in identifying suspects to clear cases. Commanders echoed those perceptions and viewed the technologies as improving their situational awareness of occurrences within their command areas.

A module network analysis of MRTCC-assisted cases empirically validated the survey findings that the use of MRTCC technologies had become integrated into case processing. That

analysis revealed that MRTCC technologies were being used in conjunction with other traditional types of evidence such as human-based, crime scene, and warrant-based evidence. It was also found that they were equally related to those other forms of evidence and had similar and, in some cases, greater roles in processing cases. The added value of this level of integration of MRTCC technologies is that it substantially improves the ability of officers and detectives to triangulate information across evidence sources which should improve the strength and validity of cases.

Finally, using a quasi-experimental design that compared MRTCC-assisted case clearances and the time to clearance with those of a stratified randomly drawn control sample, found that MRTCC-assisted cases had significantly greater odds of being cleared compared to those cases that did not receive MRTCC support. After controlling for crime incident and case processing characteristics, the MRTCC-assisted cases had 66 percent better odds of being cleared compared to those cases not receiving MRTCC support. This was a considerable improvement from estimates that adjusted solely for victim characteristics, where the odds of a violent crime case being cleared were 39 percent better for MRTCC-assisted cases compared to control cases.

The analysis also found that the use of MRTCC technologies did not shorten the amount of time taken to clear cases. MRTCC-assisted cases had an average of 44 days to clearance while the control sample had an average of 19 days. A Kaplan Meyer survival analysis which plots the trend lines of clearances across time also revealed that MRTCC cases took significantly more days to clear cases compared to the control sample. However, after adjusting for case characteristics in a Cox Proportional Hazards regression model, no significant differences in the time to case clearance were found between the two samples. Thus, while the use of MRTCC technologies did not reduce the amount of time that it took to clear cases, once case-level circumstances were taken

into consideration, the use of MRTCC technologies did not prolong the time that it took to clear cases either.

<u>Lessons Learned</u>

Through the development and ongoing operation of the MRTCC, several lessons were learned by unit administrators. These included how to utilize personnel within the unit, setting boundaries, positioning the unit for future development, and maintaining the unit as it progresses. These were viewpoints developed through trial and error within the MPD which may be unique to the Miami experience. Nonetheless, they might also be useful for other jurisdictions working to develop their own RTCC capabilities.

1. *Identify specific roles for staff within the unit, do not repurpose individuals.*

An RTCC chain of command should establish clear and delineated roles for those employed within the unit. In the initial year of operations which were pre-Covid, the MRTCC recognized that an analyst position would alleviate some of the workload and demands placed on the sworn officers operating the MRTCC unit. In a trial phase, analysts from the Crime Analysis Unit were rotated in with MRTCC shifts to provide analytical support. This became problematic since the nature of the analytic function within the MRTCC was different from that carried out in the crime analysis unit. Considerable time to retrain the analysts would be required which would not be possible if it were to be done on a rotating basis with all crime analysts. Additionally, extracting personnel from their typical crime analysis function created an additional burden on the crime analysis unit since that unit was already functioning with limited personnel. The approach of repurposing crime analysts was quickly suspended. Instead, the MRTCC began creating a new MRTCC analyst position that is distinct from the role of a crime analyst to work exclusively within the MRTCC. This was also believed to be true for the sworn detectives operating within the unit.

For example, if a sworn detective has an intelligence function (i.e., social media and facial recognition operator), they should not be tasked with other duties such as extracting and saving video footage or deploying mobile trailers.

2. *Set boundaries on the functions that the RTCC will perform. Avoid "mission creep."*

As an RTCC grows, it may find that some duties and responsibilities that previously fell under another unit will start to creep into the responsibility of the RTCC (e.g., public record requests, Crime Stoppers). While there may be a tendency to undertake those new functions, it is important to not outreach the unit's capacity. Do not let these side functions become a burden to RTCC personnel. Avoid taking them on. This is also true of individuals or units who may consider the RTCC their own personal hub. As the usefulness of the unit becomes recognized within the department, some individuals or units may try to take priority use of the RTCC resources for their own purposes at the exclusion of other officers or units. This should be avoided. Ensure everyone follows and respects an established evidence request system.

3. *Create the RTCC unit with anticipation for growth.*

When constructing an RTCC and establishing its location within the agency, ensure that future growth is calculated into the equation. Any substantial increase in CCTV coverage will require the addition of monitors, personnel, and space. Be sure not to outgrow yourself within the first few years of launch. Relatedly, as the RTCC grows and becomes central to department-wide operations maintaining secure backup storage will become critical. The storage system will need to archive large amounts of incoming evidentiary information that can later be retrieved. In the initial period, the MRTCC was solely storing evidence on a hard drive. If something was to occur to the drive, evidence would be permanently lost. It is better to consider acquiring a cloud-based storage system at the onset of launching an RTCC even if it is not initially needed. Finally, when

it comes to adding new technologies to the RTCC, entertain all options and demo everything. Be mindful that all vendors will try to convince you their product is the best. Avoid adopting a technology or information system based on another agency's success with it or due to the size of another agency's RTCC jurisdiction. Be sure that the technology or information system is designed to meet the needs and network of your RTCC (e.g., point-to-point network as opposed to a connected network).

4. *Continually maintain the RTCC as it grows.*

From the initial development of the RTCC, it is important to establish standard operating procedures, document everything as it occurs, and build ongoing training for RTCC personnel as new technologies are acquired. Even during the initial periods after launching an RTCC it is important to establish standard operating procedures to avoid inconsistencies in how work is done within the unit, how requests are made for RTCC evidence, and the rules for handling the information that the RTCC deploys. Without this, workflows can become disorganized and inefficient and the potential for confidential information to be inappropriately disclosed will be increased. Another important part of effective maintenance is to document everything that the RTCC does. This information will be critical for justifying requests for additional personnel, information technologies, and computer hardware systems. Documentation is also critical for evaluating the impact of the RTCC. A final consideration for maintaining the RTCC as it grows is to continually train unit personnel on new technologies and software systems as they are adopted. A training manual should also be created as these technologies are added. This will ensure consistency within the unit and will also provide a seamless transition for new incoming RTCC personnel.

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Appendix A.

Real Time Crime Center Standard Operating Procedures

City of Miami

ARTHUR NORIEGA, V
City Manager

REAL TIME CRIME CENTER

STANDARD OPERATING PROCEDURES

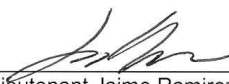**MISSION, GOALS AND OBJECTIVES**

I. **MISSION:**

The Real Time Crime Center will support the core business of the department and serve the community making our city a safer place to live and work by providing situational awareness to enhance and improve the response and investigative capabilities of our organization.

II. **GOALS:**

To collate, analyze and rapidly disseminate critical information to officers in the field thereby enhancing their situational awareness. The situational awareness will allow officers in the field to augment tactical decision making and enhancing officer safety.

III. **OBJECTIVE:**

To provide a 24/7 real time actionable information thereby enhancing the situational awareness and creating a "virtual arrival" scenario for officers responding to priority service calls and developing situations/ critical incidents.

Lieutenant Jaime Ramirez
Commander
Investigative Intelligence Unit

4/7/21

Effective Date

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City of Miami

ARTHUR NORIEGA, V
City Manager

REAL TIME CRIME CENTER

STANDARD OPERATING PROCEDURES

DUTY HOURS AND DRESS CODE

To provide procedures for Work Schedule and Dress Code for personnel assigned to the Real Time Crime

I. DUTY HOURS

A. The duty hours for the Unit Commander are flexible but normally 0800-1800.

B. The duty hours for the Unit Sergeants are flexible but are normally 0600-1600 and 0700-1700.

C. The duty hours for the sworn and non-sworn members are based on each particular detail assignments. Hours may be changed to facilitate the Unit needs, with approval of the Unit Commander.

II. DRESS CODE

The dress code requirements for the Real Time Crime Center Unit are the standard attire as prescribed in the Departmental Orders. Dress attire may be modified at the discretion of the Unit Commander for certain operations.

A. All Criminal Intelligence Investigators must always maintain a complete set of police uniforms and equipment for immediate use.

Lieutenant Jaime Ramirez
Commander
Investigative Intelligence Unit

4/7/21
Effective Date

City of Miami

ARTHUR NORIEGA, V
City Manager

REAL TIME CRIME CENTER

STANDARD OPERATING PROCEDURES

DUTIES AND RESPONSIBILITIES OF MEMBERS

I. **Duties and Responsibilities of the Real Time Crime Center Unit Commander**

A. Assume overall command and authority for the Real Time Crime Center Unit.

B. Ensure that all tasks are completed according to Unit S.O.P.s and Departmental Orders.

C. Authorize temporary and permanent changes to Unit S.O.P.s.

D. Determine and implement policies regarding assigned tasks and arbitrate conflicts which arise among employees.

E. Establish duty hours for employees.

F. Ensure completion and authorization of administrative tasks.

G. Adjust schedule so as to maximize time to adequately command the Unit.

H. Review all paperwork to include reports, logs, and requests for accuracy.

I. Identify goals and objectives for the Unit.

J. Coordinate and direct activities of the personnel.

K. Ensure that written correspondence is within departmental guidelines and complies with policy.

Lieutenant Jaime Ramirez
Commander
Investigative Intelligence Unit

4/7/21

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DUTIES AND RESPONSIBILITIES OF MEMBERS:
(Continuation)

    L. Ensure that all daily, weekly, and monthly reports are properly prepared and forwarded on time.

    M. Identify training needs of Unit personnel.

    N. Identify organizational deficiencies within the Unit and take corrective action as needed.

    O. Coordinate the evaluation of Unit systems to ensure desired results.

    P. Review incoming material for appropriate action and/or assignment.

    Q. Review outgoing material for content and quality.

    R. Delineate areas of responsibility and allocate resources accordingly.

    S. Attend meetings as directed.

    T. Prepare studies and special reports as directed.

    U. Direct the development of policies and procedures as needed to maximize productivity.

    V. Brief Section Commander about any major incidents.

II. **Notification of the Real Time Crime Center Unit Commander**

    A. Whenever a department report, involving Real Time Crime Center Unit member, requires a review and on the scene investigation by a command level officer (Lieutenant and above). These reports include Response to Resistance Report, Discharge of Firearms, Vehicle Accidents, etc.

    B. Whenever a Real Time Crime Center Unit member is admitted into hospital for any reason while on duty.

    C. Any other time, on or off-duty, when a Real Time Crime Center Unit member desires the services of a command level officer to deal with a professional or personal issue.

    D. All major cases (i.e. cases of major interest to the community and news media).

III. **Duties and Responsibilities of Investigative Intelligence Unit Sergeants**

    A. Keep the Unit Commanding Officer informed of the progress of any investigation.

    B. Plan Unit's current, continuing, and future activities.

DUTIES AND RESPONSIBILITIES OF MEMBERS:
(Continuation)

C. Maintain direction and control of Unit's members for:

1. Use of equipment

2. On–duty appearance

3. Court appearance

4. Public contacts

5. Attendance and punctuality

6. Attitude towards assignment

D. Take into consideration the individual officer's experience when making assignments.

E. Maintain a high level of efficiency by ensuring continued training.

F. Disseminate information concerning legal and court opinions to Unit members.

G. Guiding, directing, and reviewing the activities of personnel assigned to him/her.

H. Ensure compliance with Departmental Orders, Rules and Regulations, Standard Operating Procedures, applicable laws, and lawful orders of Superior officers.

I. Responsible for the work product of their Detail, including the correction of spelling and grammar, press releases, 301's, supplements, etc.

J. On crime scenes, the Supervisor will maintain a leadership role and coordinate the activities of their personnel and support personnel.

K. Responsible for informing the Unit Commanding Officer of all major cases and crimes of interest.

L. Perform administrative tasks as the Unit Commanding Officer deems necessary.

M. Maintain a file on each member assigned to him/her. These personnel files will be available for periodic review by the Unit Commanding Officer.

N. Required to attend regularly scheduled Unit meetings and be prepared to discuss current open and ongoing investigations.

DUTIES AND RESPONSIBILITIES OF MEMBERS:
(Continuation)

    O. Generate the required reports to include, but not limited to, the following:

        1. Daily, Weekly, and Monthly Activity Report

        2. Monthly On-Call list and EML Verifications

        3. Personnel Performance Evaluation

        4. Annual Vacation Request

    P. Make appropriate changes on "P" Sheets when current manpower is affected (i.e., E/O, I, V time).

    Q. When appropriate, submit the necessary documentation to nominate members of the Unit for the Officer of Month Award.

    R. Counsel Unit members when necessary (i.e., apply progressive discipline when taking action).

    S. Respond to major crime scenes to assist their personnel with the investigation and provide proper guidance.

    T. Review and approve all reports and information generated by members prior to submission or sending through channels.

    U. Ensure that reports are complete and concise.

    V. Develop inter-unit cooperation.

    W. Maintain communications with outside agencies.

    X. Contribute to the efficient and effective means of obtaining unit objectives.

IV. **Duties and Responsibilities of an Investigative Intelligence Unit Investigator**

    A. To keep their supervisor abreast of all investigations/criminal activities that are addressed by the Investigative Intelligence Unit.

    B. Participate in joint operations with other units of the Investigative Support Section.

    C. Follow the direction of their supervisor, Unit S.O.P.s, and Departmental Orders.

    D. Initiate investigations, arrests, and/or surveillances as they pertain to their assignments.

    E. Assist all departmental investigative elements and outside agencies.

    F. Provide support to other officers with their assigned duties.

DUTIES AND RESPONSIBILITIES OF MEMBERS:
(Continuation)

    G. Develop and maintain liaison with other agencies and Real Time Crime Centers.

    H. Assist in maintaining the office files.

    I. Become proficient with different social media platforms.

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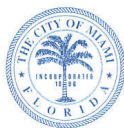
ARTHUR NORIEGA, V
City Manager

INVESTIGATIVE INTELLIGENCE UNIT

STANDARD OPERATING PROCEDURES

REAL TIME CRIME CENTER

S.O.P.:   18

SUBJECT: CLOSED-CIRCUIT TELEVISION (C.C.T.V)

PURPOSE: The purpose of this S.O.P. is to establish guidelines for the use, management, storage and retrieval of recordings from the department's CCTV system.

SCOPE: It shall be the responsibility of the City of Miami Police Department Real Time Crime Center to monitor CCTV and advise via police radio of in progress incidents. RTCC personnel will make every effort to assist field officers and investigators with obtaining information including surveillance footage pertaining to their case, while abiding by the Federal Communications Commission requirements.

I.   The Real Time Crime Center personnel will check the CCTV system daily for operational readiness.

II.   RTCC will operate the CCTV when needed on special events.

III.   RTCC will assist any unit needing assistances with CCTV video footage or surveillance and properly document on the ALPR log.

Lieutenant Jaime Ramirez
Commander
Investigative Intelligence Unit

4/7/21
Effective Date

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STANDARD OPERATING PROCEDURES: S.O.P. 18
(Continuation)

IV.   The RTCC personnel and its vendor will maintain the CCTV system.

V.   The RTCC will manage Video Management System (VMS):

    A. Create User Accounts

    B. Create User Groups

    C. Miscellaneous Items

    D. Any other relevant task associated with VMS.

VI.   The RTCC will handle all Public Record Requests per the City of Miami Police Department Public Record Unit guidelines.

VII.   For all video footage requests a RTCC Video Request Form (online) is required and must have prior approval from requesting Units Commander or designee and also be approved by RTCC Commander or designee.

VIII.   All visitors entering RTCC must complete sign in log.

IX.   Any pictures or video recordings of the RTCC room must have the approval of the RTCC Commander or designee.

City of Miami

ARTHUR NORIEGA, V
City Manager

INVESTIGATIVE INTELLIGENCE UNIT

STANDARD OPERATING PROCEDURES

REAL TIME CRIME CENTER

S.O.P.: 19

SUBJECT: AUTOMATED LICENSE PLATE READER (A.L.P.R.)

PURPOSE: The purpose of this S.O.P. is to establish guidelines for training, management, storage and retrieval of hits from the department's automated license plate reader (A.L.P.R.) systems.

SCOPE: It shall be the responsibility of the City of Miami Police Department's Real Time Crime Center to provide A.L.P.R.'s training to officers. The RTCC will also be responsible for updating and creating new user profiles and outlining the responsibilities associated with distribution, training, use, dispatch, reporting, and maintenance relating to A.L.P.R..

I. A.L.P.R. will be inspected daily by the RTCC personnel for operational readiness.

II. RTCC will conduct training on a need to basis. If the A.L.P.R. is changed or upgraded, training will be mandatory and as soon as possible.

III. RTCC will assist any unit needing assistance with A.L.P.R. systems.

Lieutenant Jaime Ramirez
Commander
Investigative Intelligence Unit

4/7/21
Effective Date

STANDARD OPERATING PROCEDURES: S.O.P. 19
(Continuation)

IV.   RTCC Unit will manage Clarity to include:

    A. Create User Accounts

    B. Reset User Accounts

    C. Miscellaneous Items

V.   RTCC will handle all Public Record request pertaining to A.L.P.R.S per the City of Miami Police Department Public Record Unit guidelines.

VI.   RTCC will follow Departmental Order 4 Chapter 9 reference storage and retrieval of data.

VII. The Real Time Crime Center Unit will assist any agency needing to use our A.L.P.R.'s as long as it follows our D.O.'s and must be logged accordingly.
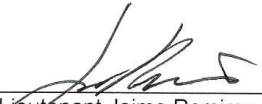
City of Miami

ARTHUR NORIEGA, V
City Manager

INVESTIGATIVE INTELLIGENCE UNIT

STANDARD OPERATING PROCEDURES

REAL TIME CRIME CENTER

S.O.P.:   20

SUBJECT: **GUNSHOT DETECTION SYSTEM**

PURPOSE: To provide personnel with overall guidelines and procedures for the proper use of our gunshot detection system.

SCOPE: The gun shot detection system is a service is intended to enhance the Department's ability to respond effectively to and investigate violent crime involving gunfire. The system uses audio sensors placed in selected areas to identity the location of gunshots. Incidents may be replayed to hear the actual audio component of the incident, aid in the collection of evidence at crime scenes, and aid in the investigation and prosecution of crimes. incidents shall be dispatched in accordance with long-standing department policy of the dispatch of crimes in progress involving the use of firearms. The purpose of the system is to reduce violent crime and incidents of indiscriminate gunfire in the City of Miami and to be incorporated into the Department's overall violent crime reduction efforts.

Lieutenant Jaime Ramirez
Commander
Investigative Intelligence Unit

4/7/21
Effective Date

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I. **Program Management**

    A. The RTCC personnel will maintain a thorough and general knowledge of service operation, deployment and usage within the Miami Police Department.

    B. The RTCC will be a liaison with various units of the organization that have access and utilize our gunshot detection system.

    C. The RTCC personnel will be responsible for monitoring the ShotSpotter system.

    D. Training material will be updated by unit personnel.

    E. All gunshot detection system training will be conducted by unit personnel.

    F. General access support will be handled by unit personnel.

    G. RTCC personnel will be responsible for contacting the vendor for support for any issues dealing with the gunshot detection system.

        1. If RTCC personnel become aware of missed or mis located incident, they must contact the vendor within 24 hours with the following information: location, date, approximate time frame, and any other pertinent information.

        2. Upon notification by a Commander or designee regarding an issue, RTCC detective must contact the vendor with the following information: location, date, approximate time frame, and any other pertinent information.

    H. Detailed reports will be made upon request.

II. **Retention/Distribution/Confidentiality**

    A. Per vendor guidelines the vendor is responsible for the storage of all audio recording and related information and will retain the information for our contracted period.

    B. Gunshot detection system Incident Reports and audio recordings shall not be released to the public, media or other outside entity without proper public records request and the authorization of the RTCC commander, or designee.

    C. In order to maintain the safety and integrity of the system, RTCC personnel shall not disclose the location or description of the gunshot detection sensors in coverage areas.

Appendix B.

Code Book for MRTCC Analytical and Control Databases

Column	Label	Code
Unique identifier*	Case number	Unique numeric value.
Date/Time Incident	Date and time of incident.	Date in mm/dd/yyyy and time in hh:mm format.
Incident Day	Day of the week that the incident occurred.	Categorical
Type*	Whether the MRTCC response was real-time, post-incident, or proactive monitoring.	Real-time, post-incident, proactive monitoring.
Date Logged*	The date the MRTCC personnel logged the incident.	Date in mm/dd/yyyy format
Time Logged*	The time the incident was logged by MRTCC personnel.	Time in hh:mm format.
Signal*	The type of crime that occurred.	The type of crime that occurred.
Unit Assisted*	The individual unit that the MRTCC assisted (e.g., homicide, burglary).	The individual unit that the MRTCC assisted (e.g., homicide, burglary).
Location*	The address of the incident location.	Descriptive measure
Net Area*	The net area of the incident location.	Categorical
Felony*	The cumulative number of felony charges associated with the arrest.	Numeric; discrete measure
Misdemeanor*	The cumulative number of misdemeanor charges associated with the arrest.	Numeric; discrete measure
Number of Arrests*	The cumulative number of arrests associated with the incident.	Numeric; discrete measure
Arrestee Age	The age of the individual at the time of arrest. If more than one individual was arrested, the demographics of the first arrestee were included.	Numeric; discrete measure.
Arrestee Sex	The sex of the individual at the time of arrest. If more than one	Dichotomous; 1 for male, 0 for female.

	individual was arrested, the demographics of the first arrestee were included.	
Arrestee Race	The race of the individual at the time of arrest. If more than one individual was arrested, the demographics of the first arrestee were included.	Dichotomous, 1 for Black, 0 for White.
Date/Time Arrest	Date and time of first arrest.	Date of arrest in mm/dd/yyyy format. Time of incident in hh:mm format.
Hours to Clearance	The number of hours calculated between the incident time and arrest time.	The formula used: =INT(arrest-incident)*24
Days to Clearance	The number of days calculated between the incident time and arrest time.	The formula used: =INT(arrest-incident)*24, followed by x/24.
Victim Age	The age of the victim at the time of arrest. If more than one individual was involved, the demographics of the first victim listed were included.	Numeric; discrete measure.
Victim Sex	The sex of the victim at the time of arrest. If more than one individual was involved, the demographics of the first victim listed were included.	Dichotomous; 1 for male, 0 for female.
Victim Race	The race of the victim at the time of arrest. If more than one individual was involved, the demographics of the first victim listed were included.	Dichotomous, 1 for Black, 0 for White.
Weapon (Other)	Whether a weapon other than a handgun was involved.	Dichotomous; coded 1 for yes, 0 for no.
Firearm*	Whether a firearm was involved.	Dichotomous; coded 1 for yes, 0 for no.
Vehicle Involved*	Whether a vehicle was involved.	Dichotomous; coded 1 for yes, 0 for no.
Narcotics Recovered*	Whether narcotics were recovered.	Dichotomous; coded 1 for yes, 0 for no.
Notes*	MRTCC personnel case notes.	Descriptive; narrative form.
IBM*	MRTCC personnel identification number.	Descriptive; numeric form.
# Officers	The number of officers involved in the incident. This does not include MRTCC personnel.	Numeric; discrete measure.

External CCTV	Whether external CCTV was accessed.	Dichotomous; coded 1 for yes, 0 for no.
External CCTV Evidence	Whether external CCTV provided evidence.	Dichotomous; coded 1 for yes, 0 for no.
No CCTV	Indicates that there were no accessible CCTV cameras in the area (external and MRTCC).	Dichotomous; coded 1 for yes, 0 for no.
MRTCC CCTV	Whether MRTCC CCTV was accessed.	Dichotomous; coded 1 for yes, 0 for no.
CCTV Evidence	Whether there was video evidence obtained.	Dichotomous; coded 1 for yes, 0 for no.
Social Media	Whether a social media search was conducted.	Dichotomous; coded 1 for yes, 0 for no.
Social Media Evidence	Whether there was social media evidence gathered.	Dichotomous; coded 1 for yes, 0 for no.
Facial Recognition	Whether a facial recognition (Clearview or Faces) search was conducted.	Dichotomous; coded 1 for yes, 0 for no.
Facial Recognition Evidence	Whether a facial recognition match was found.	Dichotomous; coded 1 for yes, 0 for no.
LPR	Whether the LPR system was utilized (Clarity or Vigilant).	Dichotomous; coded 1 for yes, 0 for no.
LPR Evidence	Whether LPR system provided evidence.	Dichotomous; coded 1 for yes, 0 for no.
ShotSpotter	Whether a ShotSpotter alert was associated with the case.	Dichotomous; coded 1 for yes, 0 for no.
Rounds	The number of rounds associated with the ShotSpotter alert.	Numeric; discrete measure.
NIBIN	Whether NIBIN was utilized.	Dichotomous; coded 1 for yes, 0 for no.
GSR	Whether there was gunshot residue collected.	Dichotomous; coded 1 for yes, 0 for no.
Latent/DNA	Whether there was latent, or DNA swabs were conducted.	Dichotomous; coded 1 for yes, 0 for no.
Lineup	Whether a photograph or in-person line up was conducted.	Dichotomous; coded 1 for yes, 0 for no.
Lineup Evidence	Whether evidence resulted from a photograph or in-person line up	Dichotomous; coded 1 for yes, 0 for no.

#Suspects	The total number of suspects involved in the case.	Numeric; discrete measure.
#Witnesses	The total number of witnesses involved in the case.	Numeric; discrete measure.
#Victims	The total number of victims involved in the case.	Numeric; discrete measure.
#Victim Interview	Whether a victim interview was conducted.	Dichotomous; coded 1 for yes, 0 for no.
#Witness Interview	Whether a witness interview was conducted.	Dichotomous; coded 1 for yes, 0 for no.
Cell Warrant	Whether a cellphone warrant was utilized.	Dichotomous; coded 1 for yes, 0 for no.
Search Warrant	Whether a search warrant was utilized.	Dichotomous; coded 1 for yes, 0 for no.
Flyer	Whether a "need to identify (NTI) flyer" was disseminated.	Dichotomous; coded 1 for yes, 0 for no.
CSI	Whether the crime scene unit was requested.	Dichotomous; coded 1 for yes, 0 for no.
Apprehension Team	Whether an apprehension team was utilized.	Dichotomous; coded 1 for yes, 0 for no.

*Denotes that the measure was used as part of the initial MRTCC internal log

Appendix C.

Comparison of MRTCC-Assisted Cases and Randomly Drawn Control Sample by Crime Type and Neighborhood Area Stratifications (N = 1,296)

Measure	MRTCC-assisted cases n (%)[1]	Control Sample n (%)[1]
Crime types		
Homicide	62 (10%)	62 (10%)
Aggravated assault	232 (36%)	232 (36%)
Assault	53 (8%)	53 (8%)
Sexual assault	23 (4%)	23 (4%)
Domestic violence	45 (7%)	45 (7%)
Robbery	233 (36%)	233 (36%)
Neighborhood Areas		
Allapattah	77 (12%)	81 (13%)
Brickell	12 (2%)	12 (2%)
Coconut Grove	11 (2%)	9 (2%)
Coral way	8 (1%)	8 (1%)
Downtown	73 (11%)	72 (11%)
Edgewater	10 (2%)	10 (2%)
Flagami	20 (3%)	20 (3%)
Little Haiti	103 (16%)	99 (15%)
Little Havana	42 (7%)	45 (7%)
Model city	100 (15%)	100 (15%)
Overtown	124 (19%)	124 (19%)
Upper East Side	8 (1%)	8 (1%)
Wynwood	60 (9%)	60 (9%)
	N = 648	N = 648

Notes: 1. May not equal 100 due to rounding. 2. For crime types, Chi-Square = 0.000, 5 df, p = 1.000, no significant differences. For neighborhood areas Chi-Square = 0.491, 12 df, p = 1.000, no significant differences.

Appendix D.

Internal Real Time Crime Center Survey Instrument

Q1. How many years have you been employed with MPD?

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Q2. What is your title/rank?

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Q3. How long have you been working in your current position?

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Q4. What is your gender identification?

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Q5. What is your ethnicity?

White	○
Hispanic or Latino	○
Black or African American	○
Native American or American Indian	○
Asian / Pacific Islander	○
Other	○

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Q12. If applicable, has the creation of the RTCC changed how you approach your work? If yes, how so?

Please rate the following on a scale of "not easy at all" to "extremely easy."

< 	Q13. On a scale of 1 to 10 how easy is it for you to obtain information from the RTCC in support of your work? 	>

Not Easy At All (1)	○
2	○
3	○
4	○
5	○
6	○
7	○
8	○
9	○
Extremely Easy (10)	○

Please rate the following on a scale of "never" to "all the time."

> Q14. How often is the information you receive from the RTCC used to decide how or what you would do next in your work?

‹ ›

1 (Never)	○

2	○

3	○

4	○

5 (50%; half the time)	○

6	○

7	○

8	○

9	○

10 (100%; all the time)	○

Q15. If applicable, since the creation of the RTCC, how often is the information you receive useful?

Almost never	◯

Sometimes, but mostly not	◯

About half of the time (50/50)	◯

Most of the time, but not always	◯

Almost always	◯

N/A	◯

Q16. Are there any things about the RTCC that you dislike or that seem to be a hinderance to your ability to access and use the information effectively?

Q17. In what ways could the RTCC be improved?

Please rate the following on a scale of "not satisfied at all" to "extremely satisfied."

> Q18. On the following scale indicate your overall satisfaction with the technologies and information currently provided by the RTCC.

1 (Not Satisfied At All)	○

2	○

3	○

4	○

5	○

6	○

7	○

8	○

9	○

10 (Extremely Satisfied)	○

Please rate the following on a scale of "not satisfied at all" to "extremely satisfied."

Q19. On the following scale indicate your satisfaction with the timeliness (turn-around time) of technologies and information currently provided by the RTCC.

< >

1 (Not Satisfied At All)	○
2	○
3	○
4	○
5	○
6	○
7	○
8	○
9	○
10 (Extremely Satisfied)	○

Please rate the following on a scale of "not satisfied at all" to "extremely satisfied."

Q20. On the following scale indicate your satisfaction with the accessibility of technologies and information currently provided by the RTCC.

< >

1 (Not Satisfied At All)	○
2	○
3	○
4	○
5	○
6	○
7	○
8	○
9	○
10 (Extremely Satisfied)	○

Please rate the following on a scale of "not satisfied at all" to "extremely satisfied."

> Q21. On the following scale indicate your satisfaction with the procedures required (process) in using the technologies and information currently housed within the RTCC.

<

>

1 (Not Satisfied At All)	○

2	○

3	○

4	○

5	○

6	○

7	○

8	○

9	○

10 (Extremely Satisfied)	○

Q22. In which of the following areas could the RTCC be improved (check all that apply)

More information sources	☐
Quality of information	☐
Timeliness (turn-around)	☐
Accessibility	☐
Procedure	☐
Other	☐

Q23. Based on your experience and if applicable, the RTCC has improved the ability to develop investigative leads in support of my work.

Strongly Agree	○
Agree	○
Neutral/not sure	○
Disagree	○
Strongly Disagree	○
N/A	○

Q24. Based on your experience and if applicable, the RTCC has improved the ability to gather evidence in support of my work.

Strongly Agree	○

Agree	○

Neutral/not sure	○

Disagree	○

Strongly Disagree	○

N/A	○

Q25. Based on your experience and if applicable, the RTCC has shortened the amount of time that it takes to gather evidence and/or develop investigative leads.

Strongly Agree	○

Agree	○

Neutral/not sure	○

Disagree	○

Strongly Disagree	○

N/A	○

Q26. Based on your experience and if applicable, the RTCC has increased the number of cases that have been cleared.

Strongly Agree	○
Agree	○
Neutral/not sure	○
Disagree	○
Strongly Disagree	○
N/A	○

Q27. Based on your experience and if applicable, the RTCC has shortened the amount of time that it takes to clear cases.

Strongly Agree	○
Agree	○
Neutral/not sure	○
Disagree	○
Strongly Disagree	○
N/A	○

Q28. Overall, the establishment of the RTCC has improved my ability to carry out my duties.

Strongly Agree	○

Agree	○

Neutral/not sure	○

Disagree	○

Strongly Disagree	○

N/A	○

Q29. Are there any other thoughts or comments you would like to provide on the RTCC that we have not covered?