The impact of COVID-19 on police officer activities

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ABSTRACT

Objective: This study examined the impact of COVID-19 on police reactive and proactive activities in Houston, Texas. Seven types of police officer reactivity and three distinct categories of proactivity were examined.
Methods: Weekly calls for service data from January 1, 2018-December 31, 2020 were analyzed through interrupted time series using ARIMA models.
Results: Police responses to property, traffic-related activities, and service-related calls all decreased when compared to previous years. A significant increase was observed for violent crime calls. Self-initiated activities performed by specialized crime units significantly decreased, but there was a significant increase in self-initiated patrol. Activities performed by a specialized response unit initially increased, but then went back to pre-pandemic levels following the death of George Floyd.
Conclusions: Observed decreases in reactivity may be attributed to changes in citizens' routine activities. COVID-19 was associated with increased demands for police responses to violence, consistent with extant research. A unique contribution of this study was the incorporation of officer proactivity. Changes to proactive patrol could also be attributed to changes in the routine activities of citizens. This study adds to the growing body of literature examining the impact of COVID-19 on police services.

1. Introduction

Policing has been affected in a myriad of ways by the COVID-19 pandemic. Early on, police officers were considered "essential," similar to other frontline workers and public servants, requiring continued service to their respective communities. Throughout the pandemic, officers continued to work at an increased risk of exposure to the virus (Bates, 2020; International Association of Chiefs of Police [IACP], 2020). Departments often experienced personnel shortages as officers contracted the virus and needed to quarantine (Schuppe, 2020). Officers may have also been tasked with enforcing social distancing guidelines and mandates while altering arrest strategies (Barba, 2020; Garcia, 2020; Mccullough, 2020; Montgomery, 2020; Sandoval, 2020). As a result, the pandemic required changes to police operating policies (Maskály, Ivković, & Neyroud, 2021) and, perhaps, a more "precautionary" approach to police activities (Nix, Ivanov, & Pickett, 2021, p. 546).

Two areas of police work that have received attention in relation to the pandemic are calls for service (CFS) and proactive police activities. Several studies have examined changes to CFS patterns either for specific call types (Demir & Park, 2021; Koziarski, 2021; Lersch, 2020;

Miller, Segal, & Spencer, 2021; Nix & Richards, 2021) or more generally across multiple call types and/or jurisdictions (Ashby, 2020; Dai, Xia, & Han, 2021; Mohler et al., 2020; White, Orosco, & Terpstra, 2022). Collectively, the results indicate that CFS trends have not been uniform, with variation observed between cities or call type (e.g., Ashby, 2020). While surveys of law enforcement executives have noted changes in proactive policing activities (Lum, Maupin, & Stoltz, 2020a, 2020b; Maskály et al., 2021), empirical investigations have yet to examine how activities other than aggregate officer-initiated activities or traffic stops specifically have been impacted (see Ashby, 2020; Mohler et al., 2020; White et al., 2022). As such, it is important that police activities continue to be explored across diverse jurisdictions to help inform local police leaders, practitioners, and the public about the potential impact of the pandemic on police operations.

The current inquiry adds to the body of knowledge in this area by exploring potential changes to both reactive and proactive officer activities brought on by the pandemic using CFS data from Houston, Texas collected from January 1, 2018 through December 31, 2020. This study is informed by routine activity theory and perspectives on proactive policing. Trends are examined for seven different call types: violent crime, property offenses, disorder incidents, suspicious incidents, traffic-

related activities, service-related activities, and non-crime events. In doing so, observed trends can be compared to the other large jurisdictions to further our understanding of how the pandemic has impacted demands for police services (e.g., Ashby, 2020). We also examine trends in officer proactivity through officer-initiated activities identified in the CFS data performed by three units: patrol, specialized crime investigation units, and the department's specialized response unit. This provides a unique look into how COVID-19 may have influenced officer-initiated activities.

2. Literature review

2.1. The impact of COVID-19 on police activities

Law enforcement executives have noted the impact of the pandemic on police activities. Based on survey data collected from 989 US and Canadian executive officers who are members of the IACP, Lum et al. (2020a) noted several reported changes in police operations during the initial months of the pandemic. By March 23, 2020, 43% of responding agencies stopped or significantly changed their responses to CFS, 57% reported a decline in CFS, 61% implemented policies to reduce proactive stops, and 73% limited community policing activities. As of May 10, 2020, a second survey wave indicated that 53% of the responding agencies continued to have policies that limited proactivity, and 64% were still limiting community-oriented policing activities—both slight decreases from wave 1 (Lum, Maupin, & Stoltz, 2020b).

Additionally, Maskály et al. (2021) collected survey data from police executives in 27 countries around the world to assess the effects of COVID-19 on police organizations and activities. Their findings indicated that, by summer 2020, responding organizations experienced at least some changes to problem-solving or community policing activities (83%), patrol strategies (78.3%), traffic stops (68.2%), officer-initiated activities (60.9%), special operations teams' activities (54.1%), handling CFS (43.4%), and use of tactical teams (34.8%). Collectively, these results demonstrate that routine police activities have been impacted by the COVID-19 pandemic. Such changes have also led to empirical investigations of how police activities have changed since the start of the pandemic.

2.2. Effects on reactive policing: calls for service

Responding to CFS is a significant component of officers' daily activities and an important duty of law enforcement agencies. In this regard, CFS represent citizen demand for police services (Ashby, 2020). Emerging research has shown interest in the relationship between CFS and COVID-19. To date, there have been two types of investigations into CFS changes. One line of research has focused attention on specific types of calls, especially calls for mental health issues and domestic violence.

For example, Lersch (2020) examined the rate and distribution of mental health-related calls in Detroit, Michigan over a two-month period at the start of the pandemic. In comparison to the same time periods in previous years, 911 calls for mental health issues were less frequent during the first months of the pandemic. Furthermore, the geographic distribution of mental health-related calls was more evenly spread throughout the city during COVID-19 (Lersch, 2020). Koziarski (2021) focused on CFS involving persons with a perceived mental illness in Barrie, Ontario, Canada. Results from the time series analyses indicated that COVID-19 had a delayed impact on mental health-related calls, with significant increases observed beginning in October 2020.

Domestic violence calls have also received significant empirical attention since the emergence of COVID-19. Much of the prior research suggests an increase in domestic violence CFS or reported incidents at the beginning of the pandemic (Demir & Park, 2021; Leslie & Wilson, 2020; Miller et al., 2021; Nix & Richards, 2021; Piquero et al., 2020) with some support for overall increases throughout most of 2020 when compared to previous years (Richards, Nix, Mourtgos, & Adams, 2021).

As stay at home orders were lifted, some research has also observed subsequent declines in domestic violence CFS after initial increases (Nix & Richards, 2021).

A second line of research has examined COVID-19's impact on CFS more broadly. White et al. (2022) found that aggregate, citizen-initiated CFS weekly averages post-pandemic declined by approximately 22% from pre-pandemic levels in Tempe, Arizona. Other studies have examined CFS trends by call types. Dai et al. (2021) examined CFS in China for domestic violence, traffic-related issues, crimes, disputes, public security, and other call types through June 2020. Their results suggested strict, mandatory lockdowns implemented due to COVID-19 affected the overall numbers of weekly calls, but different call types varied in how they were impacted. There were significant increases for the categories of domestic violence, other, and public security, but significant decreases in dispute, crime, and traffic-related CFS (Dai et al., 2021).

Mohler et al. (2020) examined changes across vandalism, burglary, vehicle theft, domestic violence, assault, and robbery calls in Indianapolis and Los Angeles over the first month of the pandemic when shelter in place orders were first implemented. In Los Angeles, burglary calls had significantly decreased while vehicle thefts had increased since the pre-pandemic observation period. Both cities saw significant increases in domestic violence calls and decreases in robbery calls. Neither city saw significant changes to assaults or vandalism calls.

Finally, Ashby (2020) examined data from January 1, 2016 to May 10, 2020 for ten of the largest U.S. cities to determine if there were changes in service calls after the start of the pandemic. ARIMA models were used to forecast weekly total call count frequencies as well as weekly call counts broken down across 18 different call types. The frequency of total CFS was estimated to be significantly below what was forecasted for the model for multiple consecutive weeks after pandemic lockdowns occurred in six of ten cities. Three of the remaining four cities also saw non-significant decreases in total call counts. New Orleans saw an initial decrease, followed by a two-week spike in calls, then another decrease. In terms of specific call types, crime-related CFS did not deviate from expected frequencies. Domestic violence calls increased in three cities, decreased in one city, and were in the expected ranges in three cities. Disturbance calls increased in four cities but remained the same in six cities. Drug-related calls were lower than expected in two cities. Finally, traffic-related calls saw an initial decrease, but then slowly increased in later weeks of the study period (Ashby, 2020).

2.3. Proactive policing: officer-initiated activities

In the current landscape of policing, there is support for increased police proactivity (Lum, Koper, Wu, Johnson, & Stoltz, 2020; National Academy of Sciences [NAS], 2018; Weisburd & Eck, 2004). Evaluations of specific proactive policing strategies, such as targeting hotspots, focused deterrence, problem-oriented policing, and community policing, have generally found crime reduction or community satisfaction benefits (Braga, Turchan, Papachristos, & Hureau, 2019; Braga, Weisburd, & Turchan, 2018; Gill, Weisburd, Telep, Vitter, & Bennett, 2014; Hinkle, Weisburd, Telep, & Petersen, 2020; NAS, 2018). With that said, recent research has also noted a discrepancy between the implementation of specific proactive strategies and the types of proactivity police officers routinely engage in, namely officer-initiated activities conducted as a part of general patrol or traffic stops (Lum, Koper, et al., 2020).

Research on proactivity in policing suggests certain types of officer proactivity yield positive outcomes related to crime prevention and police-community relationships (see Lum, Koper, et al., 2020; NAS, 2018). Existing evidence suggests proactive activities may have been impacted as police adopted precautionary policing strategies. Precautionary policing led officers to scale down their self-initiated activities and reduce arrests for misdemeanor offenses (Nix et al., 2021). Surveys of chief executives and leaders within law enforcement agencies

demonstrated that most departments altered their approaches to pro-active policing by limiting proactive traffic stops, directed patrols or extra patrols, and self-initiated activities (Lum, Maupin, & Stoltz, 2020a; Maskály et al., 2021). In this regard, COVID-19 likely altered departments' operational strategies for proactively addressing crime and crime-related issues.

There is reason to believe that officer-initiated activity has been impacted by the COVID-19 pandemic (see Lum, Koper, et al., 2020; Lum, Maupin, & Stoltz, 2020a; Maskály et al., 2021; Nix et al., 2021). Less research, however, has been conducted focusing on how officer-initiated activities changed after the pandemic began. Some CFS research controlled for officer-initiated activities (Ashby, 2020) in their analyses for specific cities. Both Ashby (2020) and Mohler et al. (2020) examined changes in self-initiated traffic stop trends and found that self-initiated traffic stops significantly decreased during the initial months of the pandemic. White et al. (2022) found that aggregate officer-initiated CFS significantly decreased in Tempe, Arizona after the onset of COVID-19.

2.4. Police activities and the death of George Floyd

Approximately 10 weeks after the onset of COVID-19 in the U.S., the murder of George Floyd also had a significant impact on policing. While George Floyd's death and subsequent national reform efforts have changed the policing landscape (see White et al., 2022), research on the impact of this incident on police activities is only currently emerging. Research on a similar topic—the "Ferguson Effect"—does provide insight as to how George Floyd's death could impact police activities. There is some empirical support suggesting that officers may be less willing to be proactive (Deuchar, Fallik, & Crichlow, 2019) and, to a lesser extent, engage in community partnerships (Wolfe & Nix, 2016) because of such circumstances.[1]

Initial research on the impact of George Floyd's death has led to different conclusions. Demir and Park (2021) found that Black Lives Matter protests resulting from George Floyd's death did not lead to a change in assault CFS in Burlington, Vermont. On the other hand, there was a significant increase in reported firearm incidents after Floyd's death in Minneapolis, Minnesota, but not in two Midwestern cities used as comparison sites (Boehme, Kaminski, & Nolan, 2022). Another recent study found that citizen cooperation and engagement with police (measured as the ratio of citizen CFS relative to ShotSpotter gunshot detections) significantly decreased after George Floyd's murder across eight U.S. cities (Ang, Bencsik, Bruhn, & Derenoncourt, 2021).

In one of the only studies on the joint effect of COVID-19 and the George Floyd incident on police activities to date, White et al. (2022) found that both aggregate officer-initiated CFS declined after the onset of the pandemic and then again after the Floyd incident. Although the officer-initiated calls eventually returned to pre-pandemic levels in November 2020, the observed trend led to the conclusion that the initial declines were "evidence of an interactive effect between the pandemic and George Floyd's death" (White et al., 2022, p. 20). Collectively, the results from each of these studies suggests the need to account for George Floyd's death when examining the impact of COVID-19 on police activities, especially for CFS related to violence or for jurisdictions directly affected by the incident. This is applicable to the current inquiry, given that George Floyd had direct ties to the study site.

2.5. Theoretical framework

Cohen and Felson's (1979) routine activity theory is an opportunity theory that posits for crime to occur, the convergence of a motivated offender, a suitable target, and the absence of a capable guardian in time and space is necessary (Cohen & Felson, 1979; Lilly, Cullen, & Ball, 2019). Societal changes in routine activities affect the likelihood of these factors converging (Cohen & Felson, 1979). Previously, researchers have examined the impact of other exceptional events on civilian routine activities and the demand for police services (see Decker, Varano, & Greene, 2007; LeBeau, 2002). During the COVID-19 pandemic, major societal changes occurred, and civilian routine activities were dramatically altered. With more people staying home because of school and non-essential business closures and remote work options, opportunities for crime shifted as target suitability changed (Dai et al., 2021; Hodgkinson & Andresen, 2020). As a result, police officer activities and the demand for police services were affected by changes in individual routine activities and behavioral patterns (Cohen & Felson, 1979; Nix & Richards, 2021). Routine activity theory and existing research suggest that crime, as well as CFS, are products of individual routine activities (Cohen & Felson, 1979; Decker et al., 2007; LeBeau, 2002; Nix & Richards, 2021). Applying a routine activity theoretical lens to the COVID-19 pandemic and police officer activities in the city of Houston, certain types of CFS may have increased while others may have decreased due to changes in individual behavior, thereby impacting the demand for police services. For example, one may expect fewer CFS for residential burglaries or property offenses as capable guardians were more likely to be present, reducing target suitability. As travel was limited to essential activities, it is reasonable to suspect that traffic-related CFS decreased.

In sum, as COVID-19 emerged, there were significant changes to civilian routine activities. This study examines how these changes have not only impacted the public demand for police services and the types of CFS officers received, but also the proactive activities officers engaged in as their interactions with the public were altered. Recent research has also examined the impact of COVID-19 on CFS using a routine activity theoretical framework (see Dai et al., 2021; Demir & Park, 2021; Hodgkinson & Andresen, 2020; Nix & Richards, 2021; White et al., 2022).

2.6. Current study

Despite the mounting research related to COVID-19 and police activities, there remain several gaps in the current body of literature. First, there is a lack of focus on proactivity and self-initiated activities—a salient aspect of policing. Second, several studies on CFS changes were published shortly after the emergence of COVID-19 and were unable to account for long-term trends and potential impacts outside of a few weeks or months. Lastly, results across studies suggest substantial variation in the effect of COVID-19 on police activities. Studies have noted differences in either perceived changes across departments (Maskály et al., 2021) or CFS trends across various cities and/or call types (Ashby, 2020; Dai et al., 2021; Mohler et al., 2020; Nix & Richards, 2021). In reflecting on his own research findings, Ashby (2020) noted, "[o]ne important finding from this study is that there is unlikely to be a single universal experience of coronavirus among police departments: different agencies may experience different changes. This means that the availability of data from multiple agencies will be crucial in developing our understanding of reactive patrol policing during a major public health emergency" (p. 1070). Overall, there remains a need for additional research to better understand the impact of COVID-19 on police activities (see also Lum, Maupin, & Stoltz, 2020a).

The current study contributes to the growing body of literature on COVID-19's effect on police activities in the following ways. First, the current study examines police activities by their responses to seven different call types from the beginning of the pandemic throughout 2020. Furthermore, we investigate officer-initiated activities in relation to general patrol, specialized response units, and specialized crime units. Finally, the study site is Houston, Texas, a large US city that has not been observed in prior studies. As such, observed trends can be compared to the other large jurisdictions to further our understanding of how the

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[1] While Wolfe and Nix (2016) found that the negative publicity surrounding the police was associated with a decrease in officer willingness to engage in community partnerships, the effect became non-significant once perceptions of organizational justice and self-legitimacy were accounted for.

pandemic has impacted police activities (e.g., Ashby, 2020). In this regard, the research questions include: (RQ1) Are there significant differences in the types of police responses to citizen's CFS since COVID-19, compared to previous years? (RQ2) Are there significant differences in officer-initiated activities for patrol, specialized crime units, and specialized response unites since COVID-19, compared to previous years?

3. Methods

3.1. Study site

Houston is the fourth largest city in the United States with a population of about 2.4 million. In 2020, the city had a violent crime (murder, rape, robbery, and aggravated assault) rate of 1256 per 100,000 population, which was much higher than the state average of 443 per 100,000 (Crime in Texas, 2020). The Houston Police Department (HPD) is the fifth largest U.S. department with nearly 5100 sworn officers and over 1000 civilian personnel. Patrol operates across fifteen patrol divisions organized under three regional commands. Each patrol division also has a specialized Differential Response Team (DRT) unit. DRT officers do not respond to general CFS, but rather are tasked with addressing disorder-related problems at the neighborhood level.[2] To do this, the units work proactively with the local community to identify public safety problems and use problem-solving or other non-traditional methods to address them. The two original, guiding theoretical frameworks behind the creation of this unit were broken windows and problem-solving policing strategies (Zhang and Zhao, 2021). Finally, HPD has eleven special criminal investigation units, including Burglary & Theft, Homicide, Major Assaults & Family Violence, Robbery, Vehicular Crime, Auto Theft, Cyber & Financial Crimes, Major Offenders, Narcotics, Special Victims, and Vice subsumed under Investigations and Special Operations Command.

With respect to COVID-19, there were both state- or city/county-level restrictions and mandates issued throughout 2020. A statewide executive order temporarily closing most non-essential businesses, schools, and restaurants was issued on March 19, 2020 (Exec. Order No. GA-08, 2020). In Houston, a stay-at-home order was issued on March 24, 2020 (Harris County, 2020). Restrictions and mandates continued over the next couple of months, then the state began re-opening in phases. While the county still issued and extended stay-at-home advisories, the re-opening plan continued to progress. Then, increasing infection numbers and hospitalizations necessitated a state-wide mask order and the phased opening of businesses to be scaled back (Exec. Order No. GA-29, 2020). Most schools re-opened in person and most businesses were back to operating at between 50 and 75% capacity in the fall. In addition to COVID-19, the George Floyd homicide is also worth noting for the study site. Like other large cities, several demonstrations were held in the wake of his death. Floyd, however, grew up in Houston, and his funeral was held in the city on June 9, 2020 (Booker, 2020). It is important to incorporate these broader social circumstances alongside the current study's examination of police activities in Houston.

3.2. Data

This study relies on CFS data provided by the Houston Police Department (HPD) based on records from their Computer Aided Dispatch (CAD) system. While CFS data may not capture all activity an officer engages in, these data are one of the best resources available to understand both conventional police activities and officer proactivity (Lum, Koper, et al., 2020; Wu & Lum, 2017; Zhang and Zhao, 2021).

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[2] Examples include addressing code and ordinance violations, environmental and business regulations, as well as working with the department's crime analysis unit and local businesses to reduce crime.

Collectively, there were ten categories of police reactive and proactive activities coded from the data, and these categories make up the dependent variables for the current study. Police reactivity to CFS were coded into seven different categories using an approach consistent with previous research utilizing CFS data (see Wu & Lum, 2017). *Violent crimes* included CFS involving reported shootings, robbery, and several types of assaults. *Property offenses* was a category comprised of burglary, theft, and forgery type offenses. *Disorder incidents* consisted of an array of disturbances, including general, family, and noise CFS. *Suspicious incidents* included calls where an alarm was sounded (e.g., vehicle alarm set off) and reports involving a suspicious person or vehicle. The *traffic-related activities* category comprised CFS for traffic accidents, driving while intoxicated (DWI), and other traffic-related issues (i.e., road rage). *Service-related activities* included calls to assist first-responders, including other officers, fire fighters, or emergency medical services. Lastly, the *non-crime events* category consisted primarily of assisting specialized units with transporting individuals and responding to silent 911 calls.

The CFS data also captured proactive activities conducted by three distinct types of police units: patrol, specialized crime investigation, and the DRTs. Other than responding to calls, patrol officers also perform patrol duties, investigate suspicious activities, and form relationships with community members. Officers in specialized crime investigation divisions, such as robbery, vice, auto theft, gang, major assaults and family violence, and homicide divisions etc., mainly conduct investigations concerning specific type of offenses. Officers in DRT units do not respond to calls for service, instead, they proactively work with the community, focusing on problem solving and improving quality of life issues. These activities are all recorded as self-initiated activities within the CAD system.

The breakdown of self-initiated activities across these three units were 64.2% for patrol, 17.5% for special crime units, and 18.3% for the differential response team. Unfortunately, the HPD CFS data do not provide detailed information about the nature of self-initiated activities, such as offense or incident type for patrol officers. Activities performed by specialized crime investigation and DRT officers might be deduced approximately using the division information. But to further breakdown the activity to specific units produces small frequencies of specific offenses, which would have been insufficient to conduct meaningful analysis. For example, there were only 338 self-initiated activities recorded under gang division, and 165 self-initiated activities recorded under robbery division during the study period. The data do include some information on dispositional outcomes of police self-initiated activities. The most frequent type of action for self-initiated activities is "collecting information" for each of the three types of police units. The disposition of "collecting information" is used in instances where the incident is resolved without needing to generate an offense report or referral for further investigation. Some examples are if the officer resolves the issue by mediation, the complaint is a civil issue rather than criminal, or if it is to provide further information about an offense report that already exists. Other self-initiated actions include making an offense or supplementary report, making an arrest, issuing tickets, etc.

For each of the ten police activities, a time series variable was constructed. These time series variables were weekly time series spanning 156 seven-day periods beginning on January 1, 2018 and ending on December 31, 2020. To measure the effect of COVID-19, March 12, 2020 was chosen as the starting point for the pandemic. This day holds international significance as the day the World Health Organization suggested isolation to reduce transmission at its Mission briefing on COVID-19 (World Health Organization, 2020). It also holds local significance as the day after Houston Mayor Sylvester Turner announced an emergency health declaration and the day Houston ISD closed schools. Shortly thereafter, stay-at-home orders were issued for the city.

In this regard, the independent variable is a dummy variable, coded as 0 for the pre-interruption period, and 1 for the post-interruption period. As a result, there are 114 weeks of pre-COVID-19 (i.e., pre-interruption) data and 42 weeks of post-COVID-19 (i.e., post-

interruption) data. A visual examination of the trend line data (see Fig. 1) also indicated the presence of a step change—an abrupt effect—between the emergence of COVID-19 and the death of George Floyd for two of the ten categories: the patrol and DRT self-initiated activities. For both categories an increase in activity was observed after the COVID-19 starting point, followed by an abrupt decline following the date of George Floyd's death. To control for these, two

indicators were created to indicate the period from COVID-19 to the incident (March 12, 2020 to May 24, 2020, covering 11 weeks), and the period from the death of George Floyd (May 25, 2020) to the end of 2020 (covering 13 weeks) for these two types of self-initiated activities.
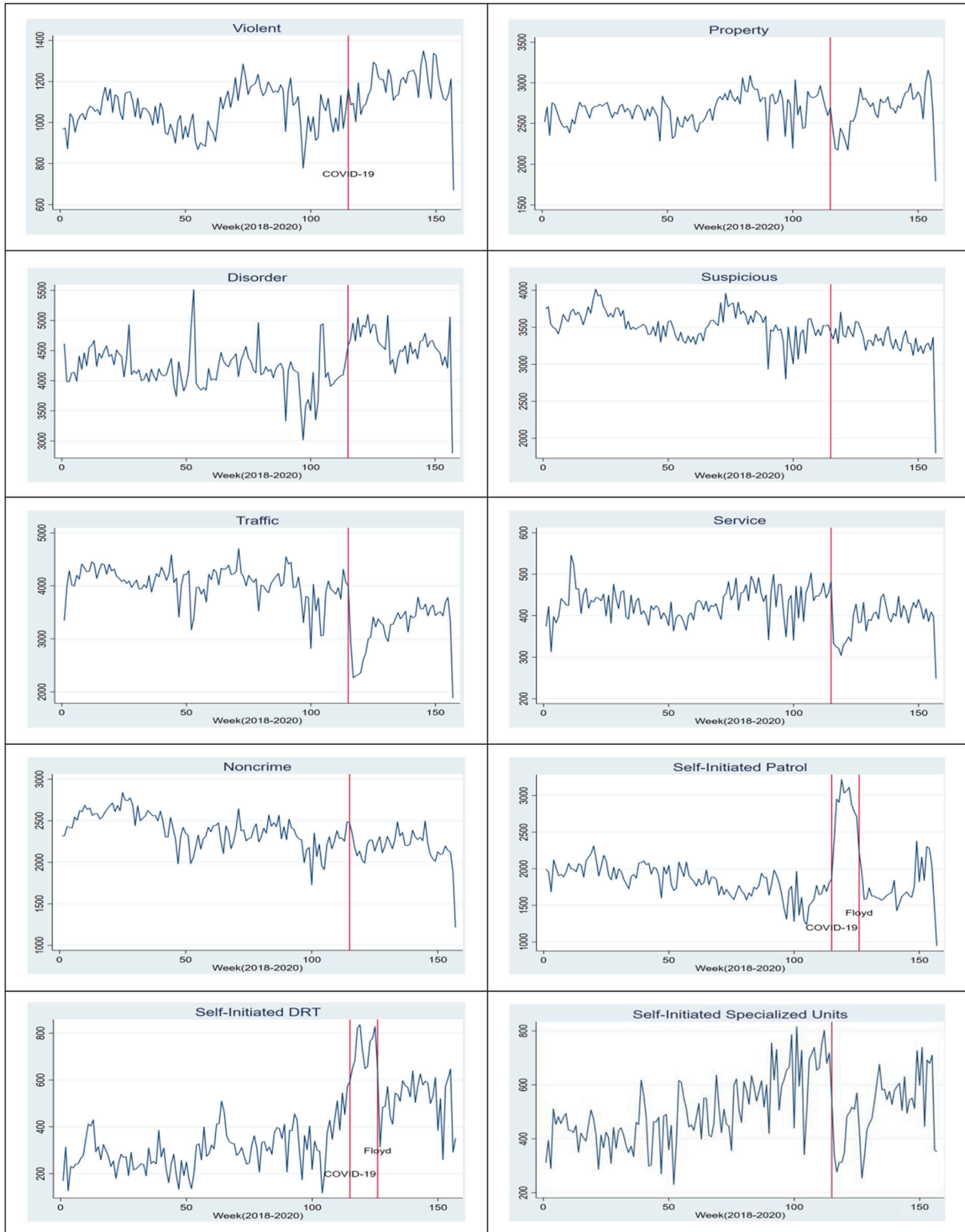

Fig. 1. Trends of police activities.

3.3. Analytic strategy

The analyses were conducted in three stages. First, illustrations of the time series variables were graphed to understand trends for each type of police activity during the study period. Descriptive analyses and *t*-tests were then conducted to check for before-and-after COVID-19 changes for each of the ten activity measures. Second, unit root tests were conducted to examine the stationarities of the time series data for each type of activity prior to the COVID-19 date. In time series analysis, the statistical estimations assume that the data used for analysis are stationary in nature. Non-stationary time series can cause unreliable and spurious results in the analysis (Granger & Newbold, 1974). To determine whether the time series variables of police activities were stationary, we conducted a series of augmented Dickey-Fuller unit root tests (Dickey & Fuller, 1979; Hamilton & Susmel, 1994).

Lastly, interrupted time series analysis was employed to examine COVID-19's impact on police reactive and proactive activities. In time series data, observations have a natural temporal ordering. Observations close in time may have stronger correlations than observations further apart. Because of this non-independence or autocorrelation, *t*-tests may not be able to detect the intervention effect adequately. Interrupted time series analysis using ARIMA modeling, which not only features a quasi-experimental design, but also takes into consideration of the autoregressive moving-average process of the data, would produce statistically more rigorous findings. Based on the results of the augmented Dickey-Fuller tests, as well as examinations of both an auto-correlation function (ACF) and partial auto-correlation function (PACF), ARIMA models for different types of policing activities were identified and analyzed. A binary variable (before-after-March 12, 2020) was set up to examine the interrupted effects of the COVID-19. In the case of examining the patrol and DRT self-initiated activities, to control for the step change between the emergence of COVID-19 and the death of George Floyd, the indicator of the George Floyd incident was also included in the models.

4. Results

4.1. Time sequence trends and t-tests

Fig. 1 presents the time sequence trend graphs for each reactivity and proactivity measure. With respect to reactivity, violent crime calls appeared to increase slightly after COVID-19. For calls for property crime, there appeared to be a reduction coinciding with COVID-19, but then a return to pre-COVID levels. Disorder calls varied greatly pre-COVID, with observable increases and decreases, but appeared to increase after COVID-19. Suspicious incident CFS exhibited a decreased trend that continued after COVID-19, but with periodic fluctuations. Traffic-related CFS notably declined after COVID-19. The visual examination of the plotted time series data for serviced-related activity calls suggested a decrease with the emergence of COVID-19. For non-crime events, there appeared to be a decreased trend before and after COVID-19.

With respect to the proactivity measures, there was a noticeable decreased trend for self-initiated patrol activities prior to COVID-19. After COVID-19, a large increase was observed followed by a substantial decline back to pre-COVID levels. A similar pattern was also observed for the DRT self-initiated activities. It should be noted that for both self-initiated activities, the observed increases post-COVID lasted until around the time of George Floyd's death, then began to decline shortly thereafter. Lastly, the visual examination of self-initiated activities for the specialized crime investigation units indicated a general increase prior to COVID-19, followed by a sharp decrease before rebounding back to higher levels.

Results of t-tests assessing the mean differences for the ten categories of police activities are displayed in Table 1. Overall, the weekly average of police responses to violent crime calls [t(154) = −6.562, p < .001], disorder incident calls [t(154) = −6.208, p < .001], self-initiated patrol

activities [t(44.965) = −1.982, p = .054], and self-initiated DRT activities [t(54.765) = −11.906, p < .001] all increased significantly. The weekly average of police responses to suspicious incidents [t(154) = 5.981, p < .001], traffic-related activities [t(56.370) = 11.106, p = .001], service-related activities [t(154) = 5.690, p < .001], and non-crime events [t(154) = 6.145, p < .001] decreased significantly after COVID-19. There were no significant differences in CFS for property offenses or self-initiated activities performed by the special crime investigation units.

4.2. Time series stationarity tests

Results of the augmented Dicky-Fuller test for unit root are displayed in Table 2. For each type of reactive and proactive activity, coefficients and significance tests are reported for the observed pre-COVID trends in the data. For violent crime calls, calls for disorder incidents, and service-related calls, the trend parameters prior to COVID-19 are insignificant (p > .05). There are significant increased trends pre-COVID-19 for property crime calls, self-initiated DRT activities, and self-initiated special crime investigation unit activities (t > 0, and p < .05). There are significant decreased trends pre-COVID-19 for suspicious incident calls, traffic-related calls, non-crime events, and self-initiated patrol activities (t < 0, and p < .05). However, results for each of the

Table 1
Independent Samples *t*-test Results (Before/During COVID-19)

Activity Type	Mean (Before)	Mean (During)	Mean Difference	t	df
Reactive					
Violent Crime	1054.38	1174.60	120.22	6.562***	154
Property Offenses	2675.56	2666.98	−8.58	0.194	54.145
Disorder Incidents	4185.10	4576.38	391.28	6.208***	154
Suspicious Incidents	3543.03	3304.88	−238.15	5.981***	154
Traffic-related Activities	4057.29	3216.60	−840.69	11.106***	56.370
Service-related Activities	430.22	389.40	−40.82	5.690***	154
Non-crime Events	2401.49	2179.67	−221.82	6.145***	154
Proactive					
Self-initiated Patrol	1838.63	2018.21	179.58	1.982*	44.965
Self-initiated DRT	301.69	571.17	269.48	11.906***	54.765
Self-initiated Special Units	499.21	511.86	12.65	0.552	154

* *p* < .1, **p < .05, ***p < .01.

Table 2
Augmented Dickey-Fuller Test of Unit Root

Activity Type	Dickey-Fuller		Trend		
	Test Statistic (Z)t	*p*-value	Coeff.	t	p-value
Violent Crime	−4.900	0.003	0.073	0.34	0.736
Property Offenses	−7.663	<0.001	1.185	2.45	0.016
Disorder Incidents	−7.108	<0.001	−1.570	−1.71	0.091
Suspicious Incidents	−6.248	<0.001	−1.106	−2.15	0.034
Traffic-related Activities	−7.362	<0.001	−2.262	−2.78	0.006
Service-related Activities	−8.264	<0.001	0.151	1.39	0.166
Non-crime Events	−5.899	<0.001	−1.798	−3.59	<0.001
Self-initiated Patrol	−7.404	<0.001	−2.860	−4.98	<0.001
Self-initiated DRT	−6.060	<0.001	0.635	2.76	0.007
Self-initiated Special Units	−8.960	<0.001	2.193	6.05	<0.001

augmented Dickey-Fuller tests reject the null hypothesis that there is a unit root in the time series data (p < .001). Experiments with fewer or more lags (1 to 3) produced the same conclusion. Even though there were some observed increased or decreased trends in police activities prior to COVID-19, it can be concluded that the time series data are stationary overall.

4.3. ARIMA models

Since results of the augmented Dickey-Fuller tests of unit roots showed that all the time series variables were stationary, ARIMA (p, d, q) models are appropriate for the interrupted time series analyses. To determine the order of autoregressive p, the degree of differencing d, and the order of moving average q, we further examined the plots of both the autocorrelation (ACF) and partial autocorrelation (PACF) functions. ARIMA models for each type of policing activity were then identified: (1) violent crime calls: ARIMA(1,0,1); (2) property crime calls: ARIMA(0,1,1); (3) disorder incident calls: ARIMA(1,1,0); (4) suspicious incidents: ARIMA(1,1,1); (5) traffic-related activities: ARIMA(0, 1, 1); (6) service-related calls: ARIMA(1, 0, 1); (7) non-crime events: ARIMA(0, 1, 1); (8) self-initiated patrol: ARIMA(1, 1, 0); (9) self-initiated activities by the DRT unit: ARIMA(0, 1, 1); and (10) self-initiated activities by special crime investigation units: ARIMA(0, 1, 1).

The effects of COVID-19 were then evaluated for each reactive and proactive category. The results of the interrupted time-series analysis are displayed in Table 3.

For police reactive activities, police responses to violent crime calls significantly increased after COVID-19. The average weekly increase was approximately 110 calls with 95% confidence interval of 28 to 192 calls. Police responses to disorder calls also increased, but not significantly. Police responses to calls for traffic-related calls, property crime, and service-related calls all decreased significantly in the weeks after COVID-19. The average weekly decrease in calls was 1431 (traffic-related), 422 (property crime), and 49 (service-related), respectively. Calls for suspicious incidents and non-crime events also decreased, but the change was insignificant.

As for the measures of officer proactivity, two indicators were used to indicate COVID-19 and the time of the George Floyd incident. Since the onset of COVID-19, self-initiated patrol increased significantly. The step increase from COVID-19 onset to the Floyd incident was 692 calls. After the Floyd incident, compared to pre-COVID-19, self-initiated patrol still increased but at a lower volume of 443 calls. Self-initiated activities by the DRT unit significantly increased after COVID-19 up until the George Floyd incident (increased by 206). After the Floyd incident, the DRT activities went back to similar levels observed pre-COVID-19. For self-initiated activities conducted by the special crime investigation units, self-initiated activities saw an average weekly decrease of 321 calls, with a 95% confidence interval of −435 to −206 calls per week. Recall that the additional step effect accounting for the Floyd incident was not necessary for this activity type (see Fig. 1).

5. Discussion

The purpose of the current study was to examine changes in both reactive and proactive police activities since the onset of the COVID-19 pandemic when compared to previous years. Specifically, data from Houston, Texas were analyzed across seven reactive categories and self-initiated activities across three units (patrol, crime investigations, and DRT) from January 1, 2018 to December 31, 2020. The results indicated that COVID-19 had notable impacts on four of the reactive measures and all three self-initiated activities. Three key findings emerged from the observed trends and are highlighted here.

First, compared to pre-COVID data, there were significant reductions for property offense, traffic, and service calls. Such decreases may be attributed to the changes in citizens' routine activities after the onset of the pandemic (Cohen & Felson, 1979; Nix & Richards, 2021). Because

Table 3
Interrupted time series analysis using ARIMA models.

Activity Type	ARIMA Models		Coef.	Std. Err.	z
Violent Crime	(1, 0, 1)	COVID-19	109.778	41.837	2.62**
		AR(1)	0.889	0.053	16.72***
		MA(1)	−0.507	0.095	−5.31***
		Cons	1056	28.838	36.65***
		Sigma	71.029	3.773	18.82***
Property Offenses	(0, 1, 1)	COVID-19	−421.902	132.833	−3.18**
		MA(1)	709	0.049	−14.55***
		Cons	4.642	4.162	1.12
		Sigma	155.939	6.633	23.51***
Disorder Incidents	(1, 1, 0)	COVID-19	490.453	1383.083	0.35
		AR(1)	−0.297	0.058	−5.15***
		Cons	−0.671	21.351	−0.03
		Sigma	328.060	11.092	29.58***
Suspicious Incidents	(1, 1, 1)	COVID-19	−97.925	223.195	−0.44
		AR(1)	−0.223	0.128	−1.74
		MA(1)	−0.513	0.128	−3.99***
		Cons	−2.017	5.218	−0.39
		Sigma	143.392	5.087	28.19***
Traffic-related Activities	(0, 1, 1)	COVID-19	−1430.867	160.587	−8.91***
		MA(1)	−0.577	0.062	−9.37***
		Cons	7.700	11.414	0.67
		Sigma	272.428	11.552	23.58***
Service-related Activities	(1, 0, 1)	COVID-19	−49.405	12.963	−3.81***
		AR(1)	0.848	0.087	9.73***
		MA(1)	−0.575	0.118	−4.88***
		Cons	433.031	8.375	51.70***
		Sigma	34.510	1.677	20.57***
Non-crime Events	(0, 1, 1)	COVID-19	−117.911	130.139	−0.91
		MA(1)	0.589	0.064	−9.24***
		Cons	−1.393	4.858	−0.29
		Sigma	130.984	6.502	20.15***
Self-initiated Patrol	(1, 1, 0)	COVID-19	691.693	144.478	4.79***
		Floyd	443.446	216.818	2.05*
		AR(1)	−0.373	0.061	−6.09***
		Cons	−4.958	11.889	−0.42
		Sigma	189.348	7.743	24.45***
Self-initiated DRT	(0, 1, 1)	COVID-19	206.383	71.366	2.89**
		Floyd	−55.126	87.230	−0.63
		MA(1)	−0.686	0.058	−11.75***
		Cons	2.051	2.362	0.87
		Sigma	81.747	4.421	18.49***
Self-initiated Special Units	(0, 1, 1)	COVID-19	−320.819	58.425	−5.49***
		MA(1)	−0.883	0.042	−20.93***
		Cons	3.473	1.023	3.40**
		Sigma	94.543	5.392	17.53***

* p < .05, **p < .01, ***p < .001.

individuals spent more time at home, increases in capable guardianship and decreases in opportunities for burglaries and thefts likely account for the decreases in property offense calls. The initial drop in traffic-related calls may also be explained by changes to citizens' routine activities. Stay-at-home orders and other directives to shelter-in-place as much as much as possible meant fewer vehicles on the road initially. Interestingly, traffic-related calls had still not returned to pre-pandemic levels by the end of 2020. As the city transitioned out of mandatory stay-at-home orders and widespread lockdowns, perhaps people continued to exercise caution by staying at home or avoiding non-essential travel throughout 2020.

Second, a significant increase was observed for violent crime calls. This finding was counter to some of the initial studies using CFS data to examine trends in aggravated assaults (Ashby, 2020; Mohler et al.,

2020) after the initial onset of COVID-19. This discrepancy could be due to measurement differences as our measure also included shootings in addition to different types of assaults. However, these initial studies only examined trends until April or mid-May of 2020 and were perhaps unable to account for longer term effects of the pandemic. For example, recent research found an increase in gun violence from the beginning of the pandemic through March 2021 across several U.S. states, including Texas generally and the Houston region specifically, when compared to the same time-period the year prior. The increases in gun violence were attributed to both prolonged psychological distress and increased gun sales resulting from the pandemic (Ssentongo et al., 2021). The current results also suggest that COVID-19 was associated with increased demands for police responses to violence, even after the initial wave of the virus.

Third, the findings indicated that officers were engaged in more frequent self-initiated patrol activities compared to the pre-pandemic data. This increase remained after the death of George Floyd (when compared to pre-pandemic data), but at a lower rate. These observed changes to proactive patrol could also be attributed to changes in the routine activities of citizens. Again, the data showed that three of the reactive call types significantly decreased post-pandemic and another three reactive call types experienced no changes in frequency. As Ashby (2020) noted, a reduction in reactive CFS could create additional time for officers to focus on other tasks, such as proactivity. The current results may also lend further support to the findings from Lum, Koper, et al. (2020) demonstrating how proactivity is often manifested as generalized patrol even after the pandemic, as well as Maskály et al. (2021) results showing increases in directed or extra patrols since COVID-19. While there was initial concern that the pandemic may have necessitated a move to precautionary policing, a recent survey revealed that citizens are not supportive of reducing preventative patrol even during the pandemic (Nix et al., 2021). In this regard, decreases in reactive demands for police services coupled with citizen expectations of police services during the pandemic could account for this increase.

The two other measures of police proactivity, however, had mixed results. The number of self-initiated activities of the DRT unit was significantly higher during the initial weeks of the pandemic but declined back down to pre-pandemic levels after the death of George Floyd. While it is unlikely that the unit's outlined goals of problem-solving and direct contact with community members could continue consistently over the course of the pandemic, the trend does suggest that the Floyd incident had an impact on DRT unit self-initiated activities (see Fig. 1). While effects of the Floyd incident on policing are still emerging, the DRT results are consistent with recent research that saw a significant decline in aggregate officer-initiated CFS immediately following George Floyd's death (White et al., 2022). Similar to White et al.'s (2022) findings in Tempe, Houston's DRT unit proactivity went back to pre-COVID levels months after the Floyd incident, perhaps further suggesting evidence of a short-term de-policing argument (p. 20). The main difference observed in Houston was the initial spike in proactive patrol and DRT unit efforts immediately following the onset of the pandemic. This trend difference could be due to the way in which proactivity was measured (i.e., aggregate versus separate).

Relatedly, overall proactivity of the specialized crime investigation units significantly declined since the onset of the pandemic through 2020. On average, this translated to 320 fewer self-initiated activities per week, although the trend does show that these activities picked back up toward the end of 2020. Given that the most frequent action recorded for self-initiated calls was information collecting, the pandemic could have impeded the ability of investigative units to solve crimes. In this regard, future research could benefit by examining the impact of COVID-19 on crime clearance rates.

An additional factor worth noting is the potential impact of Harris County Jail restrictions. In April 2020, a Harris County judge instituted a policy to reduce and control the county jail occupancy (Harris County Justice Administration, 2020). Officials began refusing to accept or prosecute persons arrested for low-level offenses (e.g., theft, minor possession of controlled substances, criminal mischief). Agency policy changes may also be a contributing factor to the observed significant decrease in proactivity. In September 2020, the HPD implemented a mandatory cite-and-release program for certain low-level offenses (City of Houston, 2020). Houston police officers may have also been subjected to agency changes similar to those adopted in other departments as a response to the COVID-19 pandemic. For example, other agency adjustments included a decrease in crime suppression deployments and crime prevention techniques and increases in risk reduction and risk mitigation strategies (see Maskály et al., 2021).

The current results should be considered relative to a few study limitations. The CFS data did not specify the nature of proactive activities that patrol, DRT officers, or investigators were engaged in. Furthermore, although the coding of the ten call categories analyzed were informed by prior research (Wu & Lum, 2017), idiosyncrasies associated with the study departments' method of cataloging and recording call information did not always allow for direct comparisons to prior research on COVID-19's impact on police services. Similarly, measuring proactivity solely through self-initiated activities from CFS data is not a flawless indicator. Officers may engage in proactive work that is not captured in these data (Lum, Koper, et al., 2020). However, this method has been established as a reasonable way to distinguish proactivity from reactivity (Lum, Koper, et al., 2020; Wu & Lum, 2017; Zhang and Zhao, 2021).

The patterns in officer reactivity and proactivity observed within a single police department may not apply to other cities or agencies, limiting generalizability. Given the differences between states in their COVID-19 responses, the current results should be contextualized for a state where initial restrictions were present but remained in place for less time and were less restrictive than other states. Police officer reactivity and proactivity may be systematically different in cities or states with more, longer-lasting restrictions. However, previous research has also stressed the need to examine the impact of COVID-19 across different departments to build a more complete body of knowledge (Ashby, 2020; Lum, Maupin, & Stoltz, 2020a).

The limitations highlight some directions for future research. First, future research should continue to examine the influence of COVID-19 on reactive and proactive activities as time goes on to determine how police activities are affected long term. Nearly two years have passed since the initial emergence of COVID-19 occurred, and the pandemic has not subsided. Rather, there have been additional strains of the virus (e. g., Delta, Omicron) that may have also impacted police officer activities. Another potential avenue for future research would be to examine changes in reactive and proactive policing before, during, and after these surges in the number of COVID-19 cases due to newly emerging variants (see also Mohler et al., 2020). Finally, most research in this area has occurred at the city-level. Within-city variation in police activities would provide jurisdictions with another layer of information for basing resource allocation decisions (e.g., Lersch, 2020).

Collectively, the overall results have practical implications for departments. The trends of police activities provide insight into how officers were spending their time in reactive and proactive work from the beginning of the pandemic throughout 2020. The results provide further support for both Ashby's (2020) and Lum, Maupin, and Stoltz (2020a) recommendation that departments use this information for future planning and resource allocation purposes. During exceptional events such as the COVID-19 pandemic, the priorities of police departments and officers may need to shift to adapt to changing and circumstances. With respect to proactive activities, the results point to the need identified by Lum, Koper, et al. (2020) whereby, "[a]gencies seeking to use proactive policing to optimize both crime prevention and community satisfaction will need to strategize about how to institutionalize a program of proactivity to simultaneously strengthen the infrastructure to encourage and facilitate it" (p. 305), with the added caveat that now strategizing must include navigating the pandemic, as well as the continued

challenges associated with the legitimacy crisis in policing.

References

Ang, D., Bencsik, P., Bruhn, J., & Derenoncourt, E. (2021). *Police violence reduces civilian cooperation and engagement with law enforcement [faculty research working paper series]*. Harvard Kennedy School of Government. https://scholar.harvard.edu/ang/publications/police-violence-reduces-civilian-cooperation-and-engagement-law-enforcement.

Ashby, M. P. J. (2020). Changes in police calls for service during the early months of the 2020 coronavirus pandemic. *Policing: A Journal of Policy and Practice, 14*(4), 1054–1072. https://doi.org/10.1093/police/paaa037

Barba, M. (2020 March 12). *Coronavirus fears prompt call for SF police to halt arrests in non-violent cases*. San Francisco Examiner. https://www.sfexaminer.com/news/coronavirus-fears-prompt-call-for-sf-police-to-stop-issuing-citations-making-arrests-in-non-violent-cases/.

Bates, J. (2020 April 2). Police departments, sheriffs' offices across the U.S. grapple with COVID-19's impact on public safety—and their own. *Time*. https://time.com/5812833/coronavirus-police-departments/.

Boehme, H. M., Kaminski, R. J., & Nolan, M. S. (2022). City-wide firearm violence spikes in Minneapolis following the murder of George Floyd: A comparative time-series analysis of three cities. *Urban Science, 6*, 16. https://doi.org/10.3390/urbansci6010016

Booker, B. (2020 June 9). *Family of George Floyd, whose death sparked protests, says final goodbye*. NPR. https://www.npr.org/2020/06/09/870808615/george-floyd-whose-death-ignited-a-social-justice-movement-to-be-buried-in-houst.

Braga, A. A., Turchan, B. S., Papachristos, A. V., & Hureau, D. M. (2019). Hot spots policing and crime reduction: An update of an ongoing systematic review and meta-analysis. *Journal of Experimental Criminology, 15*, 289–311. https://doi.org/10.1007/s11292-019-09372-3

Braga, A. A., Weisburd, D., & Turchan, B. S. (2018). Focused deterrence strategies and crime control: An updated systematic review and meta-analysis of the empirical evidence. *Criminology & Public Policy, 17*(1), 205–250. https://doi.org/10.1111/1745-9133.12353

City of Houston. (2020, Sep. 28). Executive order (EO 1–68): Cite and release program. https://www.houstontx.gov/execorders/1-68.pdf.

Cohen, L. E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review, 44*(4), 588–608. https://doi.org/10.2307/2094589

Dai, M., Xia, Y., & Han, R. (2021). The impact of lockdown on police service calls during the COVID-19 pandemic in China. *Policing, 15*(3), 1867–1881. https://doi.org/10.1093/police/paab007

Decker, S. H., Varano, S. P., & Greene, J. R. (2007). Routine crime in exceptional times: The impact of the 2002 winter Olympics on citizen demand for police services. *Journal of Criminal Justice, 35*, 89–101. https://doi.org/10.1016/j.jcrimjus.2006.11.018

Demir, M., & Park, S. (2021). The effect of COVID-19 on domestic violence and assaults. *Criminal Justice Review*, 1–19, 10.1177%2F07340168211061160.

Deuchar, R., Fallik, S. W., & Crichlow, V. J. (2019). Despondent officer narratives and the 'post-Ferguson' effect: Exploring law enforcement perspectives and strategies in a southern American state. *Policing and Society, 29*(9), 1042–1057. https://doi.org/10.1080/10439463.2018.1480020

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*(366a), 427–431. https://doi.org/10.1080/01621459.1979.10482531

Exec. Order No. GA-08. (2020). https://gov.texas.gov/uploads/files/press/EO-GA_08_COVID-19_preparedness_and_mitigation_FINAL_03-19-2020_1.pdf.

Exec. Order No. GA-29. (2020). https://gov.texas.gov/uploads/files/press/EO-GA-29-use-of-face-coverings-during-COVID-19-IMAGE-07-02-2020.pdf.

Garcia, U. J. (2020 March 24). *Phoenix police to decrease arrests for nonviolent crimes, chief says*. Arizona Republic. https://www.azcentral.com/story/news/local/phoenix/2020/03/24/phoenix-police-decrease-arrests-nonviolent-crimes-chief-jeri-williams-says-coronavirus/2912891001/.

Gill, C., Weisburd, D. L., Telep, C. W., Vitter, Z., & Bennett, T. (2014). Community-oriented policing to reduce crime, disorder, and fear and increase satisfaction and legitimacy among citizens: A systematic review. *Journal of Experimental Criminology, 10*(4), 399–428. https://doi.org/10.1007/s11292-014-9210-y

Granger, C. W., & Newbold, P. (1974). Spurious regressions in econometrics. *Journal of Econometrics, 2*(2), 111–120. http://www.climateaudit.info/pdf/others/granger.1974.pdf.

Hamilton, J. D., & Susmel, R. (1994). Autoregressive conditional heteroskedasticity and changes in regime. *Journal of Econometrics, 64*(1–2), 307–333. https://doi.org/10.1016/0304-4076(94)90067-1

Harris County. (2020, March 24). Order of county judge Lina Hidalgo: Stay home, stay safe. https://agenda.harriscountytx.gov/2020/03-24-20StayHomeWorkSafe.pdf.

Harris County Justice Administration. (2020, April 3). COVID Resources: Order by Harris County judge releasing detainees with nonviolent charges. https://jad.harriscountytx.gov/Covid-Resources.

Hinkle, J., Weisburd, D., Telep, C., & Petersen, K. (2020). Problem-oriented policing for reducing crime and disorder: An updated systematic review and meta-analysis. *Campbell Systematic Reviews*. https://doi.org/10.1002/cl2.1089

Hodgkinson, T., & Andresen, M. A. (2020). Show me a man or woman alone and I'll show you a saint: Changes in the frequency of criminal incidents during the COVID-19 pandemic. *Journal of Criminal Justice, 69*, Article 101706. https://doi.org/10.1016/j.jcrimjus.2020.101706

International Association of Chiefs of Police. (2020). COVID-19 information for law enforcement: General fact sheet. https://www.theiacp.org/sites/default/files/IACP_Covid-19_General_Factsheet.pdf.

Koziarski, J. (2021). The effect of the COVID-19 pandemic on mental health calls for police service. *Crime Science, 10*(22), 1–7. https://doi.org/10.1186/s40163-021-00157-6

LeBeau, J. (2002). The impact of a hurricane on routine activities and calls for police service: Charlotte, North Carolina, and hurricane Hugo. *Crime Prevention and Community Safety, 4*(1), 53–64. https://doi.org/10.1057/palgrave.cpcs.8140114

Lersch, K. M. (2020). COVID-19 and mental health: An examination of 911 calls for service. *Policing: A Journal of Policy and Practice, 14*(4), 1112–1126. https://doi.org/10.1093/police/paaa049

Leslie, E., & Wilson, R. (2020). Sheltering in place and domestic violence: Evidence from calls for service during COVID-19. *Journal of Public Economics, 189*(104241), Article 104241. https://doi.org/10.1016/j.jpubeco.2020.104241

Lilly, J. R., Cullen, F. T., & Ball, R. A. (2019). *Criminological theory: Context and consequences* (7th ed.). Sage.

Lum, C., Koper, C. S., Wu, X., Johnson, W., & Stoltz, M. (2020). Examining the empirical realities of proactive policing through systematic observations and computer-aided dispatch data. *Police Quarterly, 23*(3), 283–310. https://doi.org/10.1177/1098611119896081

Lum, C., Maupin, C., & Stoltz, M. (2020a). *The impact of COVID-19 on law enforcement agencies (wave 1). A joint report of the International Association of Chiefs of police and the Center for Evidence-Based Crime Policy*. George Mason University.

Lum, C., Maupin, C., & Stoltz, M. (2020b). *The impact of COVID-19 on law enforcement agencies (wave 2). A joint report of the International Association of Chiefs of police and the Center for Evidence-Based Crime Policy*. George Mason University.

Maskály, J., Ivković, S. K., & Neyroud, P. (2021). Policing the COVID-19 pandemic: Exploratory study of the types of organizational changes and police activities across the globe. *International Criminal Justice Review, 31*(3), 266–285. https://doi.org/10.1177/10575677211012807

Mccullough, J. (2020, March 23). *Police across Texas are enforcing social distancing, but they're hesitant to make arrests*. KPRC Houston. https://www.click2houston.com/news/texas/2020/03/23/police-across-texas-are-enforcing-social-distancing-but-theyre-hesitant-to-make-arrests/.

Miller, A. R., Segal, C., & Spencer, M. K. (2021). *Effects of COVID-19 shutdowns on domestic violence in US cities* (pp. 1–13). National Bureau of Economic Research, No. 29429. https://doi.org/10.3386/w29429

Mohler, G., Bertozzi, A. L., Carter, J., Short, M. B., Sledge, D., Tita, G. E., Uchida, C. D., & Brantingham, P. J. (2020). Impact of social distancing during COVID-19 pandemic on crime in Los Angeles and Indianapolis. *Journal of Criminal Justice, 68*, Article 101692. https://doi.org/10.1016/j.jcrimjus.2020.101692

Montgomery, D. (2020, October 1). *COVID-19 curbs community policing at a time of diminishing trust*. PEW. https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2020/10/01/covid-19-curbs-community-policing-at-a-time-of-diminishing-trust.

National Academies of Sciences, Engineering, and Medicine. (2018). In D. Weisburd, & M. Majmundar (Eds.), *Proactive policing: Effects on crime and communities*. Washington, DC: The National Academies Press.

Nix, J., Ivanov, S., & Pickett, J. T. (2021). What does the public want police to do during pandemics? A national experiment. *Criminology & Public Policy, 20*, 545–571. https://doi.org/10.1111/1745-9133.12535

Nix, J., & Richards, N. (2021). The immediate and long-term effects of COVID-19 stay-at-home orders on domestic violence calls for service across six U.S. jurisdictions. *Police Practice and Research: An International Journal*, 1–9. https://doi.org/10.1080/15614263.2021.1883018

Piquero, A. R., Riddell, J. R., Bishopp, S. A., Narvey, C., Reid, J. A., & Piquero, N. L. (2020). Staying home, staying safe? A short-term analysis of COVID-19 on Dallas domestic violence. *American Journal of Criminal Justice, 45*(4), 601–635. https://doi.org/10.1007/s12103-020-09531-7

Richards, T. N., Nix, J., Mourtgos, S. M., & Adams, I. T. (2021). Comparing 911 and emergency hotline calls for domestic violence in seven cities: What happened when people started staying at home due to COVID-19? *Criminology & Public Policy, 20*, 573–591. https://doi.org/10.1111/1745-9133.12564

Sandoval, E. (2020, April 14). *New role for New York police: Breaking up crowds at trader joe's*. The New York Times. https://www.nytimes.com/2020/04/14/nyregion/coronavirus-nypd-social-distancing.html.

Schuppe, J. (2020,April 4). *Police get creative to stay safe and keep order as coronavirus spreads*. NBC News. https://www.nbcnews.com/news/us-news/police-get-creative-stay-safe-keep-order-coronavirus-spreads-n1176211.

Ssentongo, P., Fronterre, C., Ssentongo, A. E., Advani, S., Heilbrunn, E. S., Hazelton, J. P., Oh, J. S., McCall-Hosenfeld, J. S., & Chinchilli, V. M. (2021). Gun violence incidence during the COVID-19 pandemic is higher than before the pandemic in the United States. *Scientific Reports, 11*, 20654. https://doi.org/10.1038/s41598-021-98813-z

Texas Department of Public Safety. (2020). Crime in Texas. https://www.dps.texas.gov/sites/default/files/documents/crimereports/20/2020cit.pdf.

Weisburd, D. L., & Eck, J. E. (2004). What can police do to reduce crime, disorder, and fear? *The Annals of the American Academy of Political and Social Science, 593*, 42–65. https://doi.org/10.1177/0002716203262548

White, M. D., Orosco, C., & Terpstra, B. (2022). Investigating the impacts of a global pandemic and George Floyd's death on crime and other features of police work. *Justice Quarterly*. https://doi.org/10.1080/07418825.2021.2022740

Wolfe, S. E., & Nix, J. (2016). The alleged "Ferguson effect" and police willingness to engage in community partnership. *Law and Human Behavior, 40*(1), 1–10. https://doi.org/10.1037/lhb0000164

World Health Organization. (2020, March 12). WHO director-general's opening remarks at the Mission briefing on COVID-19 – 12 March 2020. https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-mission-briefing-on-covid-19—12-march-2020.

Wu, X., & Lum, C. (2017). Measuring the spatial and temporal patterns of police proactivity. *Journal of Quantitative Criminology, 33*, 915–934. https://doi.org/10.1007/s10940-016-9318-5

Zhang, Y., & Zhao, S. (2021). Disorder oriented policing: A revealing case study of a special differential response unit in the Houston police department. *Crime & Delinquency, 1-24*. https://doi.org/10.1177/00111287211052444