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Geographic disparities in violent crime during the COVID-19 lockdown in Miami-Dade County, Florida, 2018–2020

Imelda K. Moise[1] · **Alex R. Piquero**[2,3]

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Abstract

Objectives This study uses two cluster detection techniques to identify clusters of violent crime during the 3 months of the 2020 COVID-19 lockdown in Miami-Dade County compared to that during an equivalent period in 2018 and 2019.

Methods Violent crime data from the Miami-Dade Central Records Bureau were analyzed. The Local Indicators of Spatial Association statistics and a space-time permutation statistic were used to identify clusters of violent crimes and outliers, and Global Moran's I tool was used to assess spatial patterning in violent crime. Neighborhood disadvantage data were obtained from the American Community Survey 5-year estimates linked with arrest locations.

Results Violent crime arrests fell by 7.1% in 2020. Arrests were concentrated in predominantly Black disadvantaged neighborhoods in the northern part, and similar results were produced for core clusters by the two cluster techniques with positive global Moran's I for all study years. Although accounting for only 17% of the county population, nearly half of violent crime arrests were for Black or African American. Males comprised most violent crime arrests.

Conclusions Crime prevention and intervention efforts should be focused on both high-risk places and offenders.

Keywords Violent crime · COVID-19 · Geographic analysis · Miami-Dade County · Violence · GIS · United States · Neighborhood Health

✉ Imelda K. Moise
moise@miami.edu

Alex R. Piquero
axp1954@miami.edu

[1] Department of Geography and Regional Studies, University of Miami, 1300 Campo Sano Ave, Coral Gables, FL 33124, USA

[2] Department of Sociology, University of Miami, 5202 University Drive, Coral Gables, FL 33124, USA

[3] Criminology, Monash University, Melbourne, Australia

Introduction

The coronavirus pandemic has had unprecedented, widespread impacts on public health systems (Robinson and Keithley, 2000; Moise et al., 2020; Moise, 2020a) including those on households across the United States of America (USA), and Miami-Dade County, Florida, the study site for our work, is no exception, and one that evinced significant cases, hospitalizations, and deaths (Piquero and Kurland, 2021). Of particular concern is the effect of the dual stress incited by "facing a pandemic" and "shelter-in-place orders" on mental health (Du et al., 2020), raising concerns about the safety and well-being of people experiencing violence and abuse within relationships (Evans, 2020). However, the evidence of "shelter-in-place orders" on crime has been mixed, with some studies reporting decreases in crime (Ashby, 2020; Boman and Gallupe, 2020), while others report increases in specific types of crime such as homicide (Rosenfeld and Lopez, 2020) and domestic violence (Piquero et al., 2021), with mixed findings regarding associated predictors (Campedelli et al., 2020a, b). Reducing different types of violence is a priority of Healthy People 2030 (Healthy People 2020, 2019), and therefore represents an important area of criminological inquiry.

Under normal circumstances, police records capture violent arrests or the changes in routine activity; however, the pandemic is likely to have affected both the incidence of violence and the police's response to it. For example, recent studies in the USA have documented important relationships between the pandemic and the reduction in crime, including with police activities (e.g., de-emphasizing certain types of crimes such as drugs) (Sisak et al., 2020), and policing demands (Laufs and Waseem, 2020). This combined may have contributed in a change in the opportunities for crime and fewer arrests (Melamed and Newall, 2020), especially at the outset of the pandemic when people were ordered to shelter in place.

Previous investigated risk factors for crime include substance use, economic stress, financial stress, and food insecurity (Gibbs et al., 2018), and many of these factors are likely to worsen in the context of a pandemic (Evans, 2020), with increases in exposure to various types of strainful events (Agnew, 1992) and changes in routine activities (Cohen and Felson, 1979). Furthermore, crime in one area can disproportionately impact on residents of adjacent communities' well-being (Kling, Liebman, and Katz, 2001). Moreover, neighborhoods also have diverse features in relation to crime and crime types (e.g., burglary or gun violence) (Felson, Jiang and Xu, 2020; Moise, 2020c). To note, one recent study observed that while burglaries declined during the COVID-19 pandemic for some US cities such as Austin, Los Angeles, Memphis, and San Francisco, they did not decrease for Boston or Louisville (Ashby, 2020). Other researchers report an increase in auto theft in St. Louis and Chicago (McDonald and Balkin, 2020; Campedelli et al., 2020a, b), while in Los Angeles, a reduction in crime (e.g., robbery, shoplifting, theft, and battery) was observed (Campedelli, Aziani and Favarin, 2020a), suggesting that solutions for one neighborhood may be different from those for another neighborhood (Moise, 2020b). Therefore, for those working towards prevention of violent crime, understanding time trends in crime during the pandemic and related consequences including knowledge of the geographic distribution of violent crime offenders is increasingly important, not only to improve community safety and health equity but also to improve the design of targeted place-based strategies (Braga and Schnell, 2013; Moise, 2020c).

Therefore, there is potential to use geospatial approaches to better understand the distribution of crime and crime types, and variation in the strength of neighborhood level predictors particularly neighborhood disadvantage across socioeconomically diverse communities such as those in Miami-Dade County, Florida. In this regard, social disorganization theory (Sampson and Groves, 1989; Sherman, Gartin and Buerger, 1989) continues to serve as an important theoretical perspective in explaining neighborhood crime. This coupled with advances in geospatial analyses has not just highlighted the concentration of crime at specific places (Weisburd, Morris and Groff, 2009; Moise, 2020c), but also helped to identify factors common to those places with high levels of crime concentration. Yet, previous studies are limited to large-scale analyses, mainly cities, thereby potentially obfuscating the extent to which crime varies at a more fine-grained scale or unit of analysis (Campedelli et al., 2020a, b). In our study area, prior work has linked arrestee factors and a neighborhood greenness index with weapon-related violent crime at the block group level. What is less clear is the nature of how the COVID-19 lockdown has affected violent crime or how neighborhood differences in violent crime arrestees vary or form patterns across socioeconomically diverse neighborhoods. In addition, to our knowledge, no study has systematically assessed whether and how the relationship between violent crime and neighborhood disadvantage differs in Miami-Dade County, Florida—especially during the pandemic and its policy lockdowns. Studying this issue within Miami-Dade County is of particular interest and importance because of its (1) unique ethnic and racial makeup that has come to form concentrated racial and ethnic enclaves and (2) the county's long-standing history of violence, especially firearm violence (Zebib, Stoler, and Zakrison, 2017).

The current study contributes to our knowledge on the distribution of violent crime during the COVID-19 lockdowns. The first objective uses two cluster detection techniques to identify clusters of high rates of violent crime arrests during the 3 months of the 2020 COVID-19 lockdown in Miami-Dade County, and compares the violent crime arrest clusters from this period and from the two cluster detection techniques to an equivalent period in 2018 and 2019 (baseline). The second objective explores the relationship between neighborhood (census tracts) predictors and violent crime clusters using a socioeconomic status (SES) index. Such findings could have important implications for violent crime arrests in different Miami-Dade County neighborhoods, an important aspect to evaluating community safety and for tailoring solutions to specific communities based on the pertinent contextual factors.

Methods

Study design and data source

A repeated cross-sectional study involving violent crime arrest locations from March 1 to May 31, 2020, and an equivalent period (March 1 to April 30 in 2018 and 2019) as baseline was performed. Included were all violent arrests for all age groups (10–76 years) identified in the Miami-Dade Central Records Bureau occurring within the Miami-Dade County Police Department (MDCPD) jurisdiction (n = 13 districts). This study period and age group were selected to provide sufficient context for assessing the

differences in violent crime arrests of all Miami-Dade County neighborhoods during a time when the state of Florida was under a lockdown over the COVID-19 crisis, and to facilitate comparison with previous years (2018 and 2019).

Crime data

Arrestee variables of interest as captured by the Miami-Dade Central Records Bureau included age, race/ethnicity, sex, person code, and person code description. In addition, included in every arrest record was an incident date, month, year, time, day of the week, the Federal Bureau of Investigation Uniform Crime Reporting (UCR) code and code description, geo district code description, address, city, and state code. Because this study focused on violent crimes that involve force or threat of force, the analysis was restricted to UCR codes 1200 (robbery), 090A (murder, non-negligent manslaughter), 110A (rape), 130A (aggravated assault), and 130D (aggravated stalking).

Outcome variable

Our outcome variable is continuous (the number of violent crime arrests during the 3-month lockdown period (2020) as well as an equivalent baseline period (2018 and 2019)). This variable assesses the differences in violent crime arrests across neighborhoods during this period. Demographic information such as gender was recorded at the aggregate-level (census tract level).

Socioeconomic status index

Because an objective of this study was to assess socioeconomic differences on violent crime arrests, census tract variables were used to generate a SES index that expands beyond those traditionally used in extant research (Darin-Mattsson, Fors and Kåreholt, 2017; Hipp and Wickes, 2017). Specifically, to create a SES index for each census tract, we obtained measures at the census tract from the 2014–2018 American Community Survey 5-year estimates. These measures were selected based on previously published criminology, public health, and health geography methods (Krieger et al., 2003; Krieger, 1992; Sampson, Raudenbush and Earls, 1997; Friedson and Sharkey, 2015), and are representative of the occupational, income, wealth, and educational characteristics of residents in each census tract. Measures included the (1) percentage of persons in the labor force who are unemployed, (2) percentage of persons living below the poverty level, (3) median household income, (4) median value of owner-occupied dwellings, and (5) percentage of persons 25 years of age or older with less than a 12th grade education. In addition, we included the (6) percentage of persons 25 years of age or older completing four or more years of college, and (7) the percentage of households that average one or more persons per room. We then used principal component analysis to ascertain the weighting of each variable within the component, with "individual component values estimated by summing the weighted scores to reach the component" (Moise, 2019). Finally, we standardized the continuous range of SES index scores to allow census tract to be scored on a 0–100 scale, with lower values indicating concentrated disadvantage and higher values indicated concentrated advantage at the component level.

Geospatial analysis

Violent crime arrestee records were geocoded and assigned to an associated census tract (n = 259 census tracts). Arrestee records without a crime location were excluded (11.3%, n = 150). The final dataset included 1174 arrestee violent crime locations for all age groups (10–76 years). Before conducting spatial analysis, rates of arrestee violent crimes per census tract per 1000 population were calculated.

To find clusters of arrestee violent crime strongly associated in place and time, we first applied a space-time permutation statistic in the SaTScan software version 9.6 and then the LISA method in ArcGIS version 10.5 to detect census tracts with a high and low number of violent crime arrestees including outliers (e.g., low-high). Thirdly, to assess the spatial patterns of violent crime arrestees (clustered, dispersed, or random), global Moran's I was used. Because there is a potential temporal lag between crime occurrence, reporting, and actual arrest, weekly analyses were run for each 3-study months for each study year (2018, 2019, and 2020). The maximum cluster size was set to a circle with a 4.09-km median distance radius to crime as defined in previous studies (Andresen, Frank, and Felson, 2013). The maximum temporal length was set to be 7 days. This denoted that the evaluation includes crime locations with a circle radius size anywhere between zero and 4.09 km, and a time length (cylinder height) of 1 to 7 days.

The permutation test for both simulations was set to 9999, which meant that the smallest P-value possible was 0.0001. Reported is the Moran's I, census tracts with high values with similar neighbors (high-high), and potential violent crime outliers areas, and from SaTScan, the most likely clusters with no adjustment used, temporal trend, cluster size, observed and expected violent crimes in the cluster, and significance. SaTScan clusters were described in terms of the associated cluster mean SES index, which was created using the 2014–2018 American Community Survey 5-year estimates, and included indicators of occupational, income, wealth, and educational characteristics of census tract residents. The index was standardized to allow census tracts to be scored on a 0–100 scale. Lower values indicate greater disadvantage and higher values indicate greater advantage at the component level. Maps were generated using ArcGIS.

Results

Violent crime rate fell by 7.1% in 2020 compared to that in 2019; n = 380 in 2018, n = 439 in 2019, and n = 355 in 2020. About 31.9% (n = 374) of violent crime arrests were committed by those aged 10–24. Nearly half (48%) of violent crime arrests were for Black or African American, although this subgroup accounts for only 17.7% of the county population. Males comprised most violent crime arrests (80.8%). Global-focused geographic clustering for violent crime arrests was confirmed by a positive global Moran's I, for study years (Moran's I 0.238, 0.234, and 0.289), $P < 0.0001$, with standard normal z-values (17.589, 17.170, and 21.10). The two local clustering techniques produced similar results for core clusters in 2018 and 2019 (Fig. 1). These clusters were located in the north part of the county in predominantly black disadvantaged neighborhoods of West Little River, Gladeview, and Brownsville. No significant clusters for violent crime arrests were detected in 2020 from the space-time permutation statistic (Table 1).

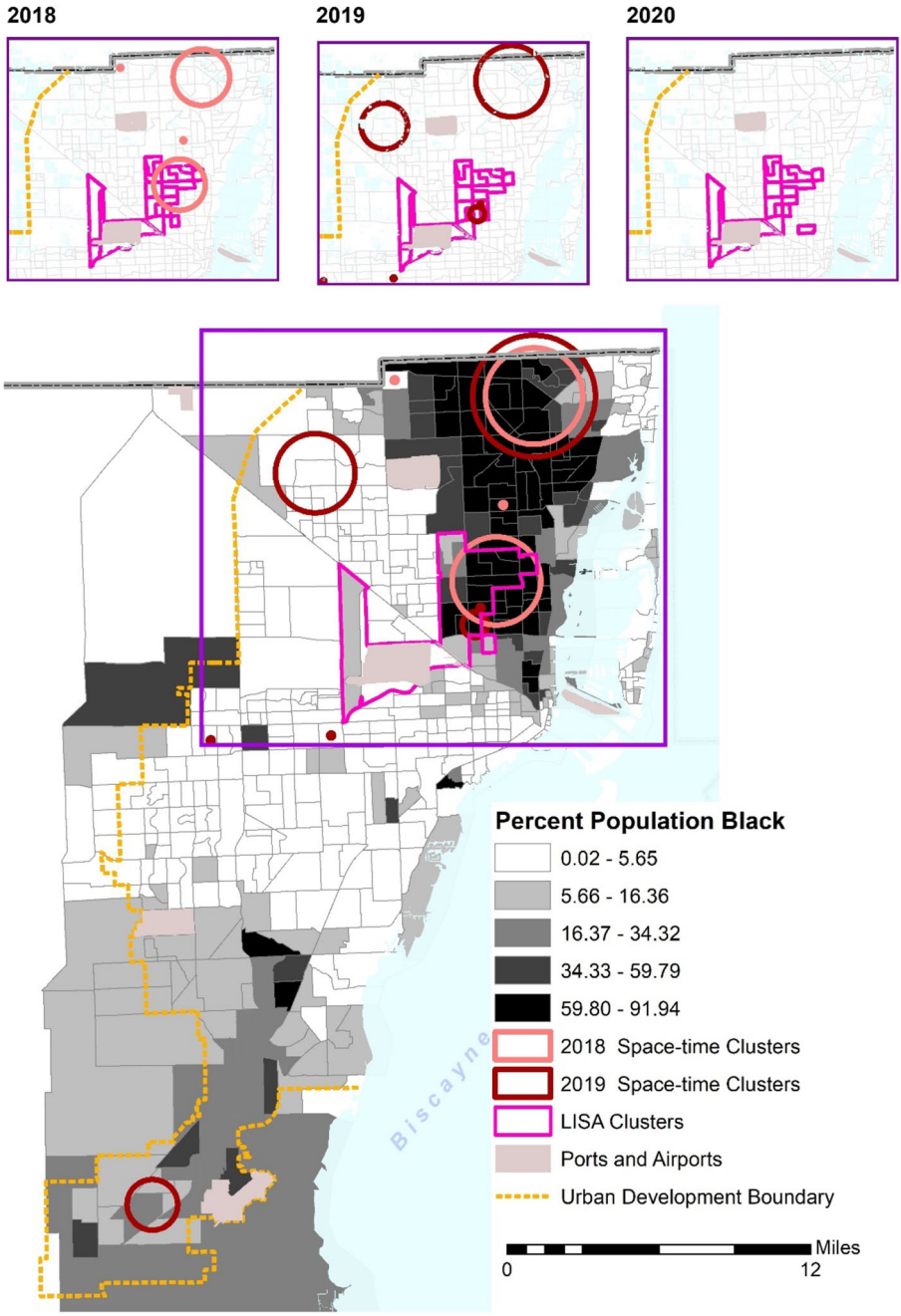

Fig. 1 Violent crime arrests, Miami-Dade County, 2018–2020. Maps of violent crime arrests in Miami-Dade County, Florida, for 2 months (March to May) in each study year (2018, 2019, and 2020). Circles represent clusters detected by a retrospective space-time statistic scan (light pink red circles = 2018 and dark red circles = 2019), with the size indicating cluster size and color indicating the year in which the cluster existed. No significant clusters were detected in 2020 from the SaTScan retrospective space-time statistic. Light pink represents violent crime arrest clusters detected by LISA. Data sources: Miami-Dade Records Bureau and US Census Bureau

Table 1 Descriptions of significant clusters of violent crime arrests detected using the SaTScan retrospective space-time scan statistic, Miami-Dade County, 2018 and 2019

Year	Cluster	Radius	Date range (biweekly)	Number of census tracts	*P*-value	Violent crime arrests		SES index score (range 0–100)
						Observed	Expected	
2018	1	0.00	2018/4/10–2018/4/16	1	$P < 0.00$	10	0.98	46.40
	2	0.00	2018/4/18–2018/4/24	1	$P < 0.00$	7	0.54	52.33
	3	3.09	2018/4/12–2018/4/18	4	$P < 0.03$	7	0.95	54.80
	4	2.82	2018/4/3–2018/4/9	9	$P < 0.04$	19	6.75	54.80
2019	1	3.90	2019/5/29–2019/6/4	10	$P < 0.00$	9	1.18	44.91
	2	0.00	2019/4/12–2019/4/18	1	$P < 0.00$	8	0.95	54.80
	3	0.82	2019/3/11–2019/3/17	3	$P < 0.02$	8	1.15	38.90
	4	1.61	2019/5/28–2019/6/3	4	$P < 0.02$	8	1.15	49.19
	5	2.53	2019/3/4–2019/3/10	2	$P < 0.02$	5	0.35	60.84
	6	0.00	2019/5/18–2019/5/24	1	$P < 0.04$	6	0.63	53.34
	7	0.00	2019/2/24–2019/3/2	1	$P < 0.05$	3	0.08	62.43

Note: Violent crime arrests included aggravated assault, aggravated stalking, murder, and non-negligent manslaughter, rape, and robbery. Dates shown are the arrest date ranges of the violent crimes displayed. No significant clusters were detected in 2020 and hence are not displayed. SES index score ranges from 0 (low) to100 (high)

Discussion

Utilizing two cluster detection techniques (the Local Indicators of Spatial Association (LISA) statistics and a space-time permutation statistic), and a repeated cross-sectional design with violent crime arrest locations, the current study aimed to identify clusters of high rates of violent crime arrests during each 3 month period in each study year (2020 - COVID-19 lockdown period), and 2018 and 2019 (baseline). We also compared the detected violent crime clusters from 2020 to an equivalent baseline period, and explored neighborhood (census tracts) predictors contributing to these clusters using a socioeconomic index in Miami-Dade County.

One unanticipated finding was the absence of significant violent crime arrest clusters in 2020 using the space-time permutation statistic, while core clusters were detected by the two cluster methods in 2018 and 2019 (baseline). A possible explanation for this lack of significant arrests can be attributed to the impact of COVID-19 on the incidence of violence and the police's response to it (Sisak et al., 2020; Laufs and Waseem, 2020; Melamed and Newall, 2020). This finding has implications for crime prevention and policing because targeting violent crime prevention strategies only to high-risk areas may have yielded minimal impact on the overall violent crime arrests in the study area during the lockdown period.

Findings from this study play an important violent crime surveillance function as it facilitates official efforts in crime prevention to identify targets of possible interest for interventions, focusing on neighborhood context and criminal offenders. However, to develop a full picture of violent crime arrests during the COVID-19 pandemic in the study area, additional studies will be needed that seek to identify areas that "did not

benefit" as much from social distancing because their social and community characteristics were "resilient" to downward change. This is an important issue for future research and that has heretofore not been studied in the COVID and crime area.

Some data limitations within our study include its reliance on official police records, our inability to distinguished crime arrests committed by unique offenders, and the limited number of control variables. Nevertheless, the current study adds to the value of previous studies conducted at larger geographic scale on the topic (Ashby, 2020; Campedelli, Aziani and Favarin, 2020a; Mohler et al., 2020; Leslie and Wilson, 2020) by performing two cluster detection techniques to examine violent crime concentration in a unique context where race, ethnicity, and neighborhood are interwoven, and detecting that most violent crime concentration occurs in areas marked by both concentrated disadvantage and mainly populated by Black residents continues to underscore the brunt of violence that is disproportionately inflicted on this group of individuals (see Sampson and Wilson, 1995; Moise, 2020c; Zebib, Stoler, and Zakrison, 2017).

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Dr. Imelda Moise is an Associate Professor of Geography in the Department of Geography and Regional Studies. She holds a Ph. D. in Geography from the University of Illinois Urban-Champaign. Trained as a health geographer, her overarching program of research focuses on families and communities at risk, with methodological expertise in utilizing quantitative and qualitative methods, often employing mixed methods study designs including geospatial analysis to examine the sociocultural and contextual factors associated with health inequities. An aspect of her research focuses on the intersection of behavioral health, crime, and neighborhood disorder. She has also received numerous awards including the College of Arts & Sciences Scholarly and Creative Recognition Award, the American Evaluation Association fellowship focusing on culturally responsive evaluation theory and practice, and is a Fulbright Specialist.

Alex R. Piquero is Professor and Chair of the Department of Sociology and Arts & Sciences Distinguished Scholar at The University of Miami and Professor of Criminology at Monash University in Melbourne Australia. He is also editor of Justice Evaluation Journal. His research interests include criminal careers, criminological theory, crime policy, evidence-based crime prevention, and quantitative research methods. He has received several research, teaching, and service awards and is fellow of both the American Society of Criminology and the Academy of Criminal Justice Sciences. He has received several research, teaching, and mentoring awards. In 2019, he received the Academy of Criminal Justice Sciences Bruce Smith, Sr. Award for outstanding contributions to criminal justice and in 2020 he was recipient of the Lifetime Achievement Award from the Division of Developmental & Life-Course Criminology of the American Society of Criminology.