

# The Effect of COVID-19 on Domestic Violence and Assaults

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## Abstract

The purpose of this research was to examine the effect of COVID-19 on four outcomes including calls for service for domestic violence, calls for service for assaults, arrests for domestic violence, and arrests for assaults in Burlington, Vermont. The data for each outcome collected over the time periods January 2012 through May 2021 were obtained from the Burlington Police Department website and then a monthly time-series data set were created. The analyses including an independent samples t-test, a Poisson regression test, and a monthly interrupted time-series analyses (ITSA) were employed to test the effects of COVID-19 on the previously mentioned outcomes. The results of the ITSA showed that in the first month following the onset of the COVID-19 pandemic, domestic violence calls statistically significantly increased, but no statistically significant change was observed in domestic violence arrests, while assault calls and assault arrests statistically significantly decreased. In addition, during COVID-19, there was a statistically significant decreasing trend in domestic violence calls and domestic violence arrests, while there was no statistically significant change in the trends of assault calls and assault arrests. The results suggest that COVID-19 had an immediate as well as a persistent effect on the numbers of domestic violence and assaults. The results and limitations of this study were also discussed.

## Keywords

COVID-19, domestic violence, assaults, pandemic, arrests

## Introduction

The COVID-19 pandemic resulted in numerous physical, mental, socio-economic effects on individuals and society. As of June 25, 2021, about 179,500,000 individuals were said to be infected by COVID-19 around the world and about 3,900,000 people had died due to COVID-19 (WHO, 2021). In the United States, as of June 25, 2021, more than 33,400,000 COVID-19 cases and more than 600,000 deaths were reported (CDC, 2021). The unemployment rate increased to 14.8% in April 2020, resulting from closures of nonessential businesses. Media polls and reports persistently presented the negative impact of the pandemic on the mental health of Americans (Falk et al., 2021; Panchal et al., 2020; Twenge & Joiner, 2020).

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Public health measures including social distancing and stay-at-home (SAH) orders implemented globally to control the spread of COVID-19 created circumstances that may however have had a profound impact on criminal offending trends, and hence the association between COVID-19 and various types of crimes has emerged as a subject of scholarly interest. This growing concern about an increasing risk of domestic violence during the pandemic was documented by several authors (Buttelt & Ferreira, 2020; Kofman & Garfin, 2020; Sharma & Borah, 2020). As well, non-profit organizations and researchers warned that the pandemic and its public health control measures may have set the stage for exacerbating the effects of isolation and heightening the vulnerability of many to domestic violence and calls for action to address this possible surge in domestic violence were made (Abramson, 2020; Campbell, 2020; Kumar, 2020; UN Women, 2020; WHO, 2020).

Contrary to the increased potential for domestic violence in the face of the pandemic, the risk of assaults in public areas away from the home was expected to decrease as a result of social distancing rules (Ashby, 2020; Campedelli, Favarin et al., 2020; Payne et al., 2020). These issues clearly highlighted the need to better understand how COVID-19 might affect violent crime and in what respect. Hence, it was believed that studying the social conditions and changes that might influence patterns of violent crimes during situations such as a pandemic was felt to possibly provide insights that could be important for developing effective policy responses to the pandemic.

Despite the importance of the problem, empirical research on the effects of COVID-19 on domestic violence and assaults is limited. Data on domestic violence in the early stages of the COVID-19 pandemic were based largely on media reports and issue briefs and reliable data on domestic violence during COVID-19 were scarce (Anurudran et al., 2020; Ertan et al., 2020; Kumar, 2020). There has been empirical research on the effect of COVID-19 on different types of crimes, including property and violent offenses (e.g., Ashby, 2020; Mohler et al., 2020; Nivette et al., 2021) as well as domestic violence (see Piquero et al., 2021), but research that specifically examines whether and how violence at home and in public spaces have changed during the COVID-19 pandemic and in what way is scarce.

This current study investigated the effect of the pandemic-related restrictions on violent crimes, particularly focusing on comparing domestic violence and assaults in Burlington, Vermont. We aimed to contribute to the research on COVID-19 and violent crimes by painting a comprehensive picture of this association, and by analyzing how the trends in domestic violence and general assaults evolved before and during COVID-19.

## Literature Review

### *Theoretical Framework*

The theoretical basis for understanding the impact of COVID-19 on violent crime is derived from general strain theory (Agnew, 1992) as well as routine activity theory (Cohen & Felson, 1979). General strain theory (Agnew, 1992) posits that strain tends to create negative emotions, which in turn increases the likelihood of criminal behavior. According to Agnew (1992), there are three sources of strain: failure to achieve goals, removal of positive stimuli, and the presentation of noxious stimuli. Emotional distress resulting from strain leads individuals to take corrective actions. Criminal behavior is an illegitimate means of coping with strain-generated negative emotions, such as anger, anxiety, and depression.

Restrictions on mobility, social isolation, and economic challenges caused by COVID-19 may lead individuals to experience negative emotions that, if left unchecked by coping strategies, promote criminal behavior (Campedelli, Aziani et al., 2020; Payne et al., 2020). Multiple studies on natural disasters, health emergencies, and crisis situations have demonstrated that disaster-related stress can produce a substantial increase in domestic violence (Bell & Folkerth, 2016; Evans et al.,

2021; Gearhart et al., 2018; Onyango et al., 2019; Parkinson, 2019; Stark & Ager, 2011; Wilson et al., 1998). Job loss and financial insecurity, trauma, displacement, limited access to resources and supporting systems were identified as risk factors for domestic violence during and after disasters (Campbell, 2020; Ertan et al., 2020; Kofman & Garfin, 2020). In a review on previous pandemics, Brooks et al. (2020) indicated multiple stressors emerging during quarantines, including longer quarantine duration, fear of infection, frustration and boredom, and inadequate supply for basic needs. The experience of being quarantined is likely to create wide-ranging and negative psychological problems such as trauma and stress related disorders, depression, and anger. These mental health issues have been shown to increase the occurrence of violence (Capaldi et al., 2012; Card & Dahl, 2011; Oram et al., 2014; Peterman et al., 2020; Vinkers et al., 2011). For example, in a study on mental disorders and crime, Vinkers et al. (2011) found assaults to have a strong relationship with mental health issues. Oram et al. (2014), in a systematic review and meta-analysis, suggested that psychiatric disorders increased the risk of violence to spouses.

Routine activity theory is a situational approach that emphasizes the presence of three factors that occur together in space and time to create criminal acts and these factors include: the presence of motivated offenders, suitable targets, and a lack of capable guardians (Cohen & Felson, 1979). Cohen and Felson (1979) suggest that structural changes in societal routine activities influence crime rates and patterns by affecting the likelihood of the convergence of these three elements in time and place.

The noticeable change in routine activities during the COVID-19 pandemic has been the dramatic reduction in social interactions and activities observed in public spaces in response to containment measures (Estévez-Soto, 2021). This change may affect criminal behaviors in various ways. For example, the decrease in time spent in public is likely to reduce street crimes (e.g., assaults and robbery) by limiting opportunities for interactions between potential offenders and targets. On the other hand, the increase in time spent at home may increase the potential risk for domestic violence by preventing victims from leaving offenders living in the same household or from seeking help from formal support services due to social isolation measures related to the COVID-19 pandemic (Estévez-Soto, 2021; Payne et al., 2020; Rauhaus et al., 2020). Social isolation has been related to an observed increase in the risk of domestic violence in some contexts (e.g., immigrant communities, rural areas) (Capaldi et al., 2012; Lanier & Maume, 2009; Myhill & Hohl, 2019). Isolating victims from their social support system is a common tactic used by abusers to control their victims (Lyons & Brewer, 2021; Raghavan et al., 2019).

### **Prior Research**

Since the first quarter of 2020, scholars have started to explore whether and how COVID-19 and its social restrictions have changed the frequency and pattern of criminal behavior. Although some studies have indicated that overall crime rates declined after COVID-19 related-restrictions were imposed, there was also evidence that the impact of the COVID-19 pandemic on crime was not consistent across crime types and communities (Campedelli, Favarin et al., 2020; Felson et al., 2020; Nivette et al., 2021; Stickle & Felson, 2020).

There are several studies that have focused on the effects of COVID-19 on domestic violence and assaults. Mohler et al. (2020) analyzed the counts of police calls for service in Los Angeles and Indianapolis for major crime categories. They made comparisons before and after shelter-in-place orders from January through April of 2020 and found a significant increase of domestic violence incidents in both cities, but no effect on assaults. In a study on shelter-in-place and domestic violence, Leslie and Wilson (2020) used official domestic violence calls for service in 14 large metropolitan cities in the United States during the periods of March through May of 2020. Their findings indicated that the pandemic increased domestic violence calls during the first five weeks after social distancing

started. Several other studies on domestic violence presented similar results. Hsu and Henke (2021), using police incidents, calls for service, and crime data from 36 police departments in the United States, found that the SAH order imposed by COVID-19 increased domestic violence from March to May of 2020. Based on police data from Atlanta, Georgia, Evans et al. (2021) examined changes in domestic violence incidents before (2018–2019) and during the COVID-19 pandemic (2020). They found an increase of domestic violence incidents during the pandemic compared to the preceding two years, especially during SAH orders. Just recently, in a meta-analysis of 18 studies from the United States ( $n=12$ ) and several other countries ( $n=6$ ) around the world, Piquero et al. (2021) found that incidents of domestic violence increased after the SAH orders were implemented.

Bullinger et al. (2020) estimated the effect of the SAH policies on police service calls, crime reports, and arrests related to domestic violence in Chicago from January 2019 to April 2020. They found that domestic violence calls increased, but official police reports and arrests for domestic violence decreased. In an analysis of domestic violence in Dallas, Piquero et al. (2020) used calls for service data and found an initial spike two weeks after the SAH order began and that subsequently declined. Ashby (2020) presented more mixed findings. In a study of crime using police-recorded data from 16 large cities in the United States during mid-January through early May, Ashby found no effect of COVID-19 on serious assaults in public places or residences in the set of cities. Campedelli, Aziani et al. (2020) analyzed daily reported crime counts in Los Angeles from January 2017 to March 2020 and found no impact of COVID-19 containment measures on intimate partner assaults, assaults with deadly weapons, and simple assaults and a significant reduction in robberies. In an analysis of the frequency of crime in Vancouver, Canada, Hodgkinson and Andresen (2020) presented no obvious change in violence. Payne et al. (2020) studied violent crime rates in Queensland, Australia. Using officially recorded police data, they found that common, serious, and sexual assaults all dropped in early stages of lockdown, though domestic violence patterns were not affected. In a study of crime using administrative data extracted from the Attorney General's Office in Mexico City, De la Miyar et al. (2021) suggested evidence of a sharp decrease in domestic violence and assaults. Finally, Nivette et al. (2021) analyzed crime data from 27 cities worldwide for six crime categories including assaults and found that SAH policies contributed to a considerable drop in urban crime.

### *Current Study*

Prior studies on the effect of COVID-19 on domestic violence and assaults have presented mixed findings. While some research (Evans et al., 2021; Hsu & Henke, 2021; Leslie & Wilson, 2020; Mohler et al., 2020; Piquero et al., 2021) documented that the COVID-19 related-restrictions were important factors explaining the observed pandemic associated increase in domestic violence, other studies (Ashby, 2020; Bullinger et al., 2020; Campedelli, Aziani et al., 2020; De la Miyar et al., 2021; Hodgkinson & Andresen, 2020; Payne et al., 2020) presented mixed or no effects of SAH orders on domestic violence. Similarly, the association between COVID-19 and assaults has been mixed. A few studies (De la Miyar et al., 2021; Nivette et al., 2021; Payne et al., 2020) showed evidence of a significant decrease in assaults during pandemic-related restrictions, while others (Ashby, 2020; Campedelli, Aziani et al., 2020; Hodgkinson & Andresen, 2020; Mohler et al., 2020) found no significant change.

Most existing research has detected the short-term effect of COVID-19 on crime by focusing on the initial weeks or months after the pandemic related restrictions were introduced, though some studies included pre-COVID data from prior years (Evans et al., 2021; Meyer et al., 2021; Payne et al., 2020). However, the long-term effects of COVID-19 and the consequences of subsequent relaxation of the social restrictions are still unclear. Research needs to examine how COVID-19

affected crime trends over time. Further, prior research on the effect of the COVID-19 pandemic on crime examined the cases in large cities or urban areas, including Atlanta, Chicago, Los Angeles, Indianapolis, and Vancouver (Bullinger et al., 2020; Evans et al., 2021; Hodgkinson & Andresen, 2020; Mohler et al., 2020). They indicated mixed results across crimes and cities. Given that the impact of COVID-19 may vary depending on the types of crime and geographical contexts (Ashby, 2020; Halford et al., 2020; Mohler et al., 2020), the association between COVID-19 and crime in different geographical settings (e.g., small or medium-sized cities) should be explored. Finally, many studies used police calls for service as a proxy for domestic violence and assaults. While police calls for service data allows us to observe the changes in incident reporting during the COVID-19 pandemic, police calls for service may not lead to police intervention such as arrests (Bullinger et al., 2020). Thus, using additional data, such as arrest data, to detect crimes warranting police intervention may help us comprehensively assess the effect of COVID-19 on crime.

The present study investigated the effect of COVID-19 on calls for service for domestic violence, calls for service for assaults, arrests for domestic violence, and arrests for assaults in Burlington, VT. In addition, the present study examined the effect of COVID-19 in the trends of the outcomes. Specifically, the study addressed the following research questions:

1. Were there any statistically significant differences in calls for service for domestic violence and assaults, and arrests for domestic violence and assaults before and during COVID-19 pandemic restrictions?
2. Were there any statistically significant changes in the trends between January 1, 2012 and May 31, 2021 in calls for service for domestic violence and assaults or arrests for domestic violence and assaults before and during COVID-19 restrictions?

## Method

### Research Setting

The study included both calls for service and arrests for domestic violence and assaults in Burlington, Vermont. As of the 2010 census, Burlington was the most populous city in Vermont with a population of about 42,500 and seated in Chittenden County (Census Bureau, 2021). White residents accounted for the most of the population (85.3%), followed by Asian (5.8%), African American (5.7%), and Hispanic (3.1%) (Census Bureau, 2021).

As of June 2, 2021, Burlington accounted for 34.5% (2,590) of 7,501 COVID-19 cases in Chittenden County, and 40.6% (104) of 256 people who died due to COVID-19 in Vermont were residing in Chittenden County (Vermont Health Department, 2021b).

### Data

The two different datasets including calls for service and arrests were obtained from the Burlington Police Department's website. The data were publicly available at the incident level and covered the periods between January 1, 2012 and May 31, 2021. Calls for service data were available by year, while arrests data included the entire arrest data between the above-mentioned dates. In total, of 299,069 calls for service, 6,047 were about domestic violence and 2,110 were about assaults. Of the 22,077 arrests, 1,548 were reported to be domestic violence incidents and 1,688 were reported to be assaults.

The monthly data for the outcomes used in the current study were created by merging calls for service data by year. Domestic violence calls ( $n = 6,047$ ) and assault calls ( $n = 2,110$ ) were filtered from the total number of calls (299,069), and using the arrest data, arrests for domestic violence

( $n = 1,548$ ) and arrests for assaults ( $n = 1,688$ ) were filtered from the total body of arrests data (22,077). The filtered datasets were aggregated into monthly counts ( $N = 113$ ) based on the outcomes using a “pivot table” built-in Excel approach. The unit of analysis employed was the monthly counts of the data of interest, and therefore separate monthly calls for service and arrest datasets were created for each dependent variable. Similar to the previous studies (e.g., Kim & Phillips, 2021; Kim et al., 2019), the current study used “count” data rather than “rate” data because there was only a 1% (402) decrease in the population observed from April 1, 2010 to April 2020 (Census, 2020), which suggests that the population was stable over time. The use of monthly count data was deemed appropriate because the use of daily or weekly count data would likely reduce the number of incidents per chosen time-period, which may affect the precision of a study (see Bhaskaran et al., 2013).

### *Variables and Measures*

The independent variable in the present study was the COVID-19 pandemic. March 2020 was selected as the “starting point” (hereafter refers to COVID-19) because Vermont confirmed the first case of COVID-19 on March 7, 2020 and in Chittenden County on March 11, 2020 (Vermont Health Department, 2021b). In addition, the governor of Vermont declared a state of emergency on March 13, 2020 and the COVID-19 restrictions started (State of Vermont, n.d.) and a SAH order was initiated on March 25 (Vermont Health Department, 2021a). It is important to note that COVID-19 and associated restrictions such as social distancing, shuttering bars, schools, gyms, fitness centers, salons, etc., suspension of mass gatherings, etc. were in place as of this writing (The City of Burlington, 2021). COVID-19 was measured as 0 = Pre-COVID-19 or 1 = during COVID-19. The period from January 2012 through February 2020, was considered as the pre-COVID-19 period, and the period from March 2020 through May 2021 was considered as the during COVID-19 period. The dataset consisted of 113 observations, 98 monthly periods pre-COVID-19, and 15 monthly periods during COVID-19. In addition, the inclusion of 8 pre-COVID-19 years in the analyses served to rule out any historical effects on the outcomes.

Four dependent variables were examined including: monthly counts of domestic violence calls, assault calls, domestic violence arrests, and assault arrests. Domestic violence (a.k.a. domestic assaults) refers to incidents causing bodily injury or fear of imminent serious bodily injury to a family or household member (see The Vermont Statutes Online, n.d., 13 V.S.A. § 1042), while the term assault refers to actions causing bodily injury to a person (see The Vermont Statutes Online, n.d., 13 V.S.A. § 608). Domestic violence calls included calls for service for domestic felony assaults, domestic misdemeanor assaults, and domestic disturbances. Assault calls involved calls for service for aggravated and simple assaults. Domestic violence arrests included arrests for domestic aggravated assaults, domestic assaults, and violation of abuse prevention order. Assault arrests included arrests for aggravated and simple assaults. Assaults on law enforcement officers were excluded. Each dependent variable was measured based on the number of monthly domestic violence calls, assault calls, domestic violence arrests, and assault arrests that occurred during each month between January 2012 through May 2021.

In regard to the four control variables, trends for each dependent variable, month, use of BWC (body-worn camera), and Black Lives Matter (hereafter BLM) protests were created to control for their effects on the outcomes: trends and month for all outcomes; use of BWC for domestic violence arrests and assault arrests; BLM protests for assault calls and assault arrests.

To control for seasonality, the variable “month” was used (see Madero-Hernandez et al., 2017) because the effects of seasonal fluctuations in the outcomes are commonly observed on a monthly basis. Individuals’ routine activities tend to be affected by those months in which people spend more time outside during the warm months (e.g., May, June, July, August, etc.) or inside during the colder months (e.g., December, January, February, etc.) (see Kim et al., 2019; Kim & Phillips,

2021). These changes in routine activities are associated with the prevalence of various crimes (Cohen & Felson, 1979). Month was measured as a binary variable for each month (The month of January being the reference group).

Trend variables for each dependent variable were included in the analysis to control for the possible changes (i.e., whether they were decreasing, increasing, or stable) in trends in the dependent variables over time because variations in outcomes might be due to trend changes rather than the intervention itself (see Linden, 2015; Madero-Hernandez et al., 2017). Madero-Hernandez et al. (2017) states:

... while the usual approach in time series analysis is to use a  $t$  (linear) or  $t^2$  (quadratic) term to control for the effect of the trend in the series over time, a new variable called “trend” was generated for each dependent variable through the use of trend formulas using the built-in function in Microsoft Excel fitted to the data. (p. 766)

Similarly, trend variables for each dependent variable were generated using trend equations obtained from the built-in function in Microsoft Excel.<sup>1</sup>

Use of BWC was measured as a binary variable (1 = yes; 0 = no). BPD outfitted all of their officers with BWCs in January 2015 (Davis, 2014). Therefore, a coding of 1 was used for the period after 2015 and a code of 0 was used for the time period before 2015. Since previous studies have shown that use of BWC is associated with arrests (e.g., Ariel, 2016; Braga et al., 2018; Groff et al., 2020; Headley et al., 2017; Hedberg et al., 2016; Huff et al., 2020; Ready & Young, 2015), the present study included BWC as a control variable.

Another control variable was the presence of BLM protests. The killing of George Floyd by police in Minneapolis on May 25, 2020 sparked BLM protests nationwide including Burlington, VT. BLM protests in Burlington, VT took place from May 30, 2020 (Vanni, 2020) until October 1, 2020 (Goldstein, 2020). The presence of BLM protests could impact calls for assaults and arrests for assaults (see Evans et al., 2021; Kim & Phillips, 2021). Therefore, to control for the potential effects of local BLM protests on arrests, a BLM protest variable was included in the analysis and the BLM protest was measured as a binary variable (1 = yes; 0 = no). The months between May and October were coded as 1 or coded as 0 otherwise.

### *Analytic Strategy*

The descriptive statistics were computed first. Then, an independent samples  $t$ -test was conducted to compare the mean counts between before and during COVID-19. For the multivariate analysis, a Poisson regression test<sup>2</sup> was conducted to compare the outcomes between before and during COVID-19 since the dependent variables were based on count data (see Long, 1997). Finally, using the *itsa* command, a monthly interrupted time-series analysis (ITSA) was estimated to statistically test the effect of COVID-19 on the trends for each outcome over time (see Linden, 2015). ITSA offered a quasi-experimental research design and was deemed appropriate for estimating changes in the trends because the data involved monthly counts of the outcomes before and during COVID-19 (see Campbell & Stanley, 1966; Shadish et al., 2002). Newey–West standard errors were estimated to adjust the standard errors to handle possible heteroskedasticity (Linden, 2015; Linden & Adams, 2011). A Cumby-Huizinga test for autocorrelation (Breusch-Godfrey) was conducted to detect any potential auto correlations, and to determine the number of lags at which the models needed to be estimated to handle any auto correlation<sup>3</sup>, which is common in time-series analysis (see Linden, 2015). All analyses were performed using the Stata version 14.2 statistical software package.

## Results

### Descriptive Statistics and Bivariate Analysis

The descriptive statistics showed that from January 2012 through May 2021, on average, the police received about 54 domestic violence calls ( $M = 53.5$ ) and 19 assault calls ( $M = 18.7$ ), made about 14 arrests for domestic violence ( $M = 13.7$ ) and 16 arrests for assaults ( $M = 15.6$ ) each month (Table 1).

The independent samples t-tests showed that compared to the pre-COVID-19 time period, arrests for both domestic violence (*Mean diff.* = 4.6) and assaults (*Mean diff.* = 5.8) statistically significantly decreased during COVID-19, while there were no statistically significant differences in calls for service for both domestic violence and assaults before and during COVID-19 although there was a decline in both outcomes (Table 1).

### Results of Multivariate Analysis

The Poisson regression tests for multivariate analyses indicated that COVID-19 statistically significantly decreased assault calls and assault arrests, but did not have a statistically significant effect on domestic violence calls and domestic violence arrests all else being equal (Table 2). The incidence rate ratios (IRRs) were converted to percentages<sup>4</sup> and reported for easy interpretation. Specifically, relative to the time period before COVID-19, during COVID-19, there was a decline of 7% in assault calls ( $IRR = 0.93$ ) and 11% in assault arrests ( $IRR = 0.89$ ).

The control variables that were statistically significantly correlated with the outcomes included trends (with all outcomes), BLM protests (with assault arrests), September and October (with domestic violence calls), and October (with assault calls) (Table 2). Specifically, the 12% decreases in domestic violence calls were statistically significant, as were domestic violence arrests by 70%, assault calls by 73%, and assault arrests by 81% and all were due to the decreasing trend of the outcomes. Assault arrests increased by 16% during BLM protests. Compared to January, domestic violence calls in September and October increased by 4% and 3%, respectively, while assault calls in October increased by 8%.

### Results of Monthly Interrupted Time-Series Analysis

Figure 1 shows that there was a decreasing trend in domestic violence calls and domestic violence arrests before COVID-19, and the decrease continued during COVID-19 after an increase that occurred just after COVID-19 began. Figure 2 shows that there was a downward trend in assault calls before COVID-19, and a decrease was observed just after COVID-19 began, but later the

**Table 1.** Descriptive Statistics and Results of Independent Samples t-Test.

Dependent variable	Descriptive Statistics				Pre-COVID-19		During COVID-19		Mean Diff.	t
	M	SD	Min	Max	M	SD	M	SD		
Domestic violence calls	53.5	12.8	31	94	54.1	12.6	49.9	13.9	-4.2	-1.2
Domestic violence arrests	13.7	4.7	4	26	14.3	4.5	9.7	3.8	-4.6	-3.8***
Assault calls	18.7	6.3	8	38	19.1	6.0	15.7	7.2	-3.4	-2.0
Assault arrests	15.6	6.0	3	30	16.4	5.8	10.6	5.1	-5.8	-3.6***

Note.  $N = 113$ .  $M$  = mean;  $SD$  = standard deviation;  $Min$  = minimum;  $Max$  = maximum;  $Mean\ Diff.$  = mean difference.

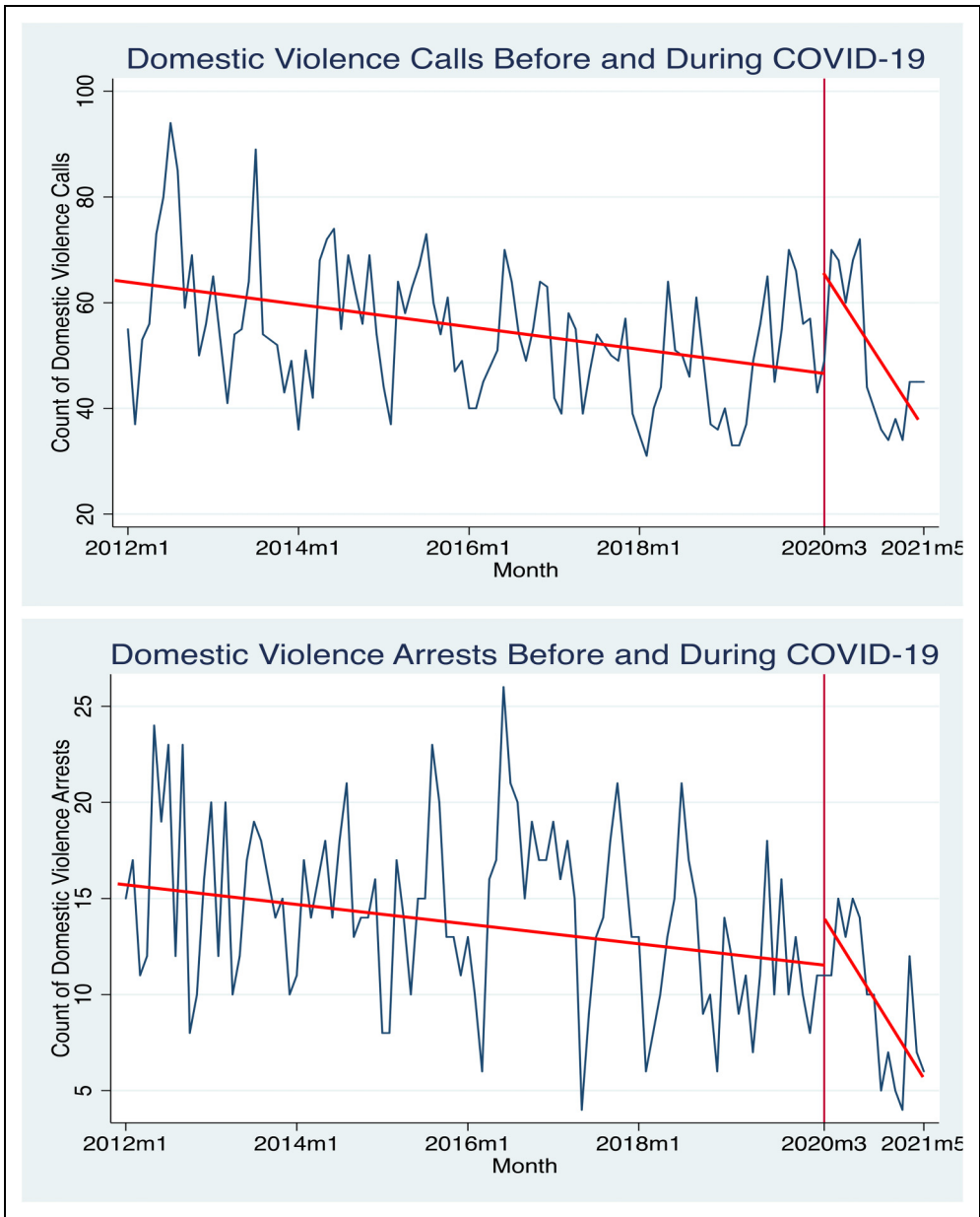
\*\*\* $p < .001$ . Pre-COVID-19 period: January 2012–February 2020 (98 months) and during COVID-19 period: March 2020–May 2021 (15 months).



**Table 2.** Comparison of Domestic Violence and Assaults Before and During COVID-19: Results of Poisson Regression Test.

Variable	Domestic violence calls			Domestic violence arrests			Assault calls			Assault arrests		
	b	Robust SE	IRR	b	Robust SE	IRR	b	Robust SE	IRR	b	Robust SE	IRR
COVID-19	-0.01	0.01	0.99	-0.04	0.04	0.96	-0.07	0.03*	0.93	-0.12	0.06*	0.89
Trend	-0.13	0.00***	0.88	-1.20	0.05***	0.30	-1.32	0.06***	0.27	-1.67	0.06***	0.19
BLM protests	—	—	—	-0.01	0.01	0.99	—	—	—	0.00	0.02	1.00
Use of BWC	—	—	—	—	—	—	0.06	0.04	—	0.15	0.07*	1.16
Month												
January (omitted)	—	—	—	—	—	—	—	—	—	—	—	—
February	-0.03	0.02	0.97	-0.01	0.03	0.99	-0.02	0.04	0.98	-0.02	0.04	0.98
March	0.01	0.02	1.01	0.01	0.03	1.01	0.05	0.03	1.05	-0.01	0.03	0.99
April	0.03	0.01	1.03	0.03	0.02	1.03	0.04	0.03	1.04	0.00	0.03	1.00
May	0.02	0.01	1.02	-0.03	0.04	0.97	0.06	0.03	1.06	0.00	0.03	1.00
June	0.02	0.02	1.02	-0.01	0.04	0.99	0.05	0.03	1.05	0.01	0.03	1.01
July	-0.01	0.02	0.99	0.00	0.03	1.00	0.01	0.04	1.01	0.01	0.03	1.01
August	0.02	0.02	1.02	0.00	0.03	1.00	0.00	0.04	1.00	-0.07	0.04	0.94
September	0.03	0.01**	1.04	0.01	0.03	1.01	0.05	0.03	1.05	-0.01	0.03	0.99
October	0.03	0.01*	1.03	0.01	0.02	1.01	0.08	0.03**	1.08	0.04	0.03	1.04
November	0.02	0.01	1.02	0.02	0.03	1.02	0.03	0.03	1.03	-0.01	0.04	0.99
December	0.01	0.02	1.01	0.01	0.03	1.01	0.03	0.03	1.03	0.01	0.04	1.01
Wald $\chi^2$		2996.0***			1246.7***			2105.0***			1509.9***	
Pseudo R <sup>2</sup>		0.333			0.260			0.297			0.328	

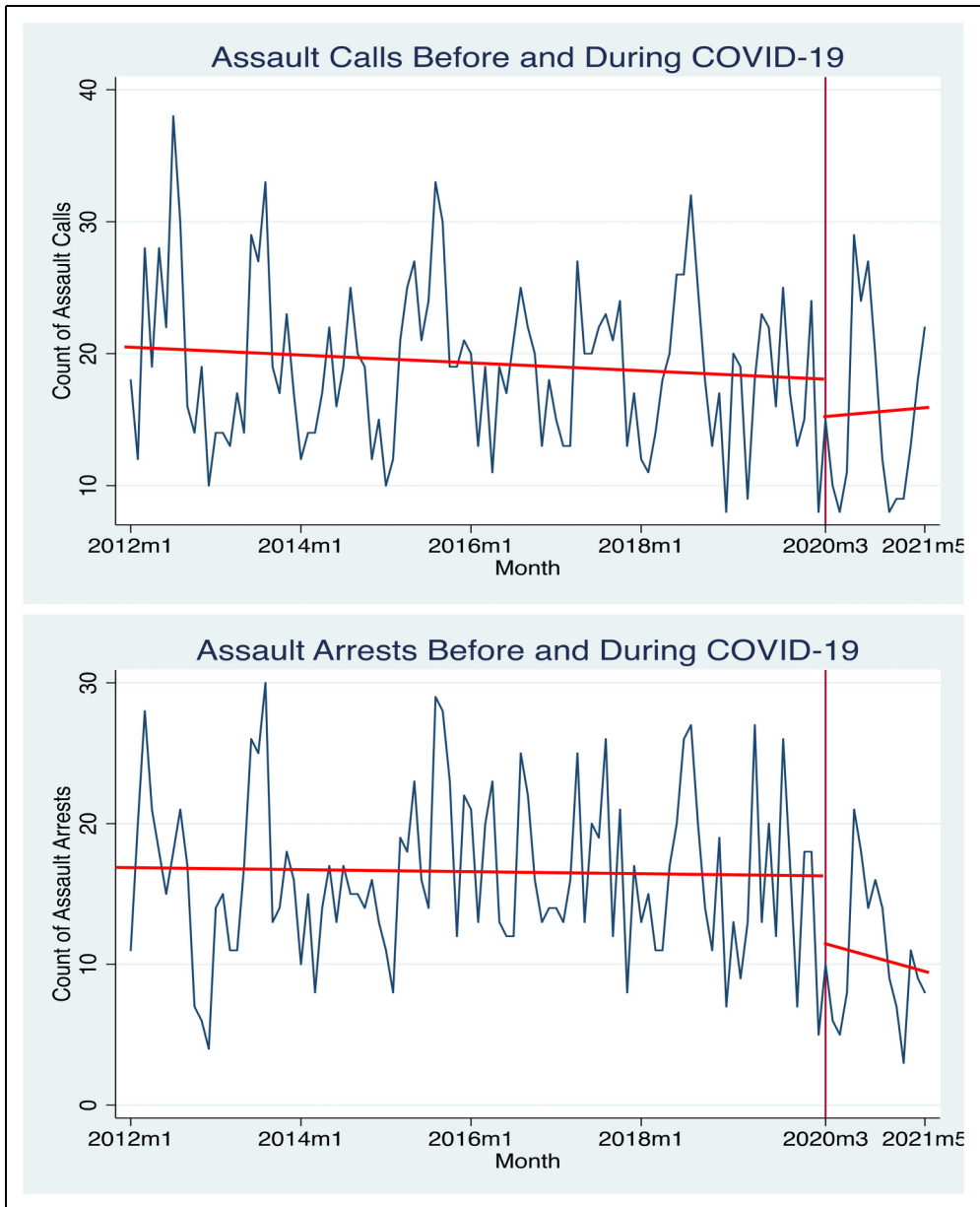
Note. N = 113. BWC = body-worn camera; BLM = black lives matter; b = standardized coefficient; SE = standard error; IRR = incidence rate ratio. Use of BWC, BLM protests, month, and trend are control variables.  
 \*\*\*p < .001. \*\*p < .01. \*p < .05.



**Figure 1.** Monthly domestic violence calls and arrests before and during COVID-19 (January 1, 2012–May 31, 2021).

trend increased little bit. Concerning assault arrests, there was a slight upward trend before COVID-19, but a sharp drop was observed just after COVID-19 began and the decrease continued during the COVID-19 period.

The monthly interrupted time-series analyses (Table 3) showed that after controlling for the effect of month,<sup>5</sup> there was a statistically significant decreasing trend in domestic violence calls and



**Figure 2.** Monthly assault calls and arrests before and during COVID-19 (January 1, 2012–May 31, 2021).

domestic violence arrests before COVID-19 ( $b = -0.16$ ,  $p < .001$  and  $b = -0.06$ ,  $p < .01$ , respectively) and during COVID-19 ( $b = -1.50$ ,  $p < .001$  and  $b = -0.42$ ,  $p < .01$ , respectively). Relative to the time period before COVID-19, there was a statistically significant decreasing trend in domestic violence calls ( $b = -1.34$ ,  $p < .01$ ) and domestic violence arrests ( $b = -0.35$ ,  $p < .05$ ) during COVID-19. Domestic violence calls statistically significantly increased ( $b = 14.07$ ,  $p < .01$ ) in the first month of the following COVID-19 (i.e., April 2020), while COVID-19 did not have a

**Table 3.** Results of the Monthly Interrupted Time-Series Analysis.

Variable	<i>b</i>	Newey-West SE	<i>T</i>	95% CI LB	95% CI UB	<i>F</i>
<i>Domestic Violence Calls</i>						6.7***
Pre-COVID-19 trend	-0.16	0.05	-3.3***	-0.25	-0.06	
COVID-19	14.07	4.85	2.9**	4.44	23.69	
During COVID-19 overall trend	-1.34	0.46	-2.9**	-2.25	-0.44	
During COVID-19 trend	-1.50	0.45	-3.3***	-2.40	-0.60	
<i>Domestic Violence Arrests</i>						6.7***
Pre-COVID-19 trend	-0.06	0.02	-2.7**	-0.11	-0.02	
COVID-19	1.15	1.33	0.9	-1.49	3.79	
During COVID-19 overall trend	-0.35	0.15	-2.3*	-0.65	-0.05	
During COVID-19 trend	-0.42	0.15	-2.8**	-0.71	-0.12	
Use of BWC	1.27	1.47	0.9	-1.65	4.19	
<i>Assault Calls</i>						8.1***
Pre-COVID-19 trend	-0.02	0.02	-1.2	-0.06	0.01	
COVID-19	-7.16	2.98	-2.4*	-13.08	-1.24	
During COVID-19 overall trend	0.53	0.26	2.0*	0.01	1.06	
During COVID-19 trend	0.51	0.262	1.9	-0.01	1.03	
BLM protests	4.78	3.43	1.4	-2.02	11.58	
<i>Assault Arrests</i>						4.4***
Pre-COVID-19 trend	-0.06	0.04	-1.7	-0.13	0.01	
COVID-19	-5.74	2.79	-2.1*	-11.28	-0.19	
During COVID-19 overall trend	0.18	0.22	0.8	-0.25	0.60	
During COVID-19 trend	0.11	0.21	0.5	-0.31	0.54	
BLM protests	2.44	2.74	0.9	-3.00	7.87	
Use of BWC	4.29	1.91	2.2*	0.49	8.09	

Note. *N* = 113. *b* = unstandardized coefficient; BWC = body-worn camera; BLM = black lives matter; SE = standard error; CI = confidence interval; LB = lower boundary; UP = upper boundary.

\*\*\**p* < .001. \*\**p* < .01. \**p* < .05.

- The control variable “month” was also included in the analyses for each outcome, but the results for month are not shown in the table. However, the results are reported in the text and as follows: Compared to January, the statistically significant increase was observed for domestic violence calls during the months from April through October, assault calls during the months from May through October, and arrests for domestic violence and assaults during the months including July, August, and September.
- Pre-COVID-19 covers the period from January 2012 till March 2020 and the pre-COVID-19 trend indicates the linear slope of the monthly outcomes prior to COVID-19.
- COVID-19 refers to the starting point of COVID-19 in March 2020. COVID-19 coefficient indicates the immediate effect of COVID-19 (i.e., the first month after March 2020).
- During COVID-19 overall trend refers to the interaction between the pre-COVID-19 trend and COVID-19, which captures the change in the overall trend during COVID-19 relative to the pre-COVID-19 trend.
- During COVID-19 trend covers the period from March 2020 through May 2021 and the during COVID-19 trend indicates the linear slope of the monthly trends in the outcomes during COVID-19.

statistically significant immediate effect (i.e., April 2020) on domestic violence arrests. In addition, all else being equal, compared to January, domestic violence calls during the months April through October and domestic violence arrests during the months July through September statistically significantly increased.

However, there was no statistically significant change in trends in assault calls and assault arrests before and during COVID-19, all else being equal. Relative to pre-COVID-19 period, there was a statistically significant increasing trend in assault calls ( $b = 0.53$ ,  $p < .05$ ) during COVID-19, but no statistically significant change in assault arrests was observed. Furthermore, assault calls ( $b$

$= -7.16, p < .05$ ) and assault arrests ( $b = -5.74, p < .05$ ) statistically significantly decreased in the first month following the onset of COVID-19 (i.e., April 2020). In addition, after adopting the use of BWCs, assault arrests ( $b = 4.29, p < .05$ ) statistically significantly increased. Finally, compared to January, assault calls during the months May through October and assault arrests during the months including July, August, and September statistically significantly increased.

It is important to note that to detect any potential autocorrelation, Cumby-Huizinga test for autocorrelation (Breusch-Godfrey) for each model was conducted. Based on the results of these autocorrelation tests, the ITSA models were estimated at lag 1 for domestic violence calls and at lag 0 for the other outcomes to obtain accurate results.

## Discussion and Conclusion

The current study examined the effect of COVID-19 on four outcomes including domestic violence calls, domestic violence arrests, assault calls, assault arrests, as well as trends in the outcomes before and during COVID-19 in Burlington, Vermont. Consistent with the findings of other studies (De la Miyar et al., 2021; Payne et al., 2020) on COVID-19 and crime, the current study found that COVID-19 was associated with a statistically significant decrease in assault calls and assault arrests in the first month following the onset of COVID-19. This reduction in assaults may be explained in view of the change in routine activities and social interactions that accompanied the pandemic early on. Routine activity theory (Cohen & Felson, 1979) suggests that crimes may increase or decrease depending on how motivated offenders the presence of suitable targets, and lack of capable guardians may converge. Assaults in public places may decrease during the COVID-19 pandemic because potential victims stay at home and have limited opportunity to interact with others, including criminals, in certain locations (e.g., bars or pubs).

Conversely, the presence of COVID-19 may increase domestic violence because victims and perpetrators are consistently in the same place without capable guardians in a potentially stressful circumstances caused by the pandemic. Consistent with previous studies (Evans et al., 2021; Hsu & Henke, 2021; Leslie & Wilson, 2020; Mohler et al., 2020; Piquero et al., 2021), the current study found that COVID-19 statistically significantly increased domestic violence calls for services, but not domestic violence arrests in the first month following COVID-19. The significant increase in domestic violence calls did not appear to impact changes in domestic violence arrests. This may be partially explained by the fact that calls for service include domestic disturbances without violence. However, to better understand the effect of COVID-19 on domestic violence arrests, research will need to examine whether COVID-19 influenced police responses to calls for services or police decisions to make arrests.

The changes in the trends for domestic violence calls and assaults calls in Burlington relatively align with the shift of routine activities and opportunities. The pattern noted by Nivette et al. (2021) of short-term changes after the SAH order and a return to previous crime levels after subsequent relaxation of measures, was also found in our study. An immediate decrease in assault calls experienced following the SAH order quickly reversed as restrictions relaxed. Significant immediate increases in domestic violence calls occurred after the SAH order and decreased after the easing of social restriction. Future research should examine the mechanisms through which the COVID-related restrictions and gradual relaxation processes affected domestic violence and assaults.

Finally, there was a statistically significant decreasing trend in domestic violence calls and domestic violence arrests, while there was no statistically significant change in the trends in assault calls and assault arrests during COVID-19. It is noteworthy that while our results suggest there was a statistically significant increase of domestic violence calls in the first month following COVID-19 as well as a significant decreasing trend in domestic violence calls and arrests during COVID-19, the exact extent of domestic violence during the COVID-19 pandemic remains unknown. Domestic violence

has been one of most under-reported crimes, with about half of all domestic violence cases being unreported to the police (Reaves, 2017). Further, mobility restrictions during the COVID-19 pandemic may have affected the ability to report domestic violence (Ashby, 2020; Campedelli, Aziani et al., 2020, Campedelli, Favarin et al., 2020; Hodgkinson & Andresen, 2020). Thus, to investigate the exact extent and nature of domestic violence, data from other sources such as victimization surveys, shelter usages, and requests for service from domestic violence agencies should be used in further research.

The study has several important limitations. First, there was imbalance between the numbers of monthly periods before and during COVID-19 because COVID-19 started in March 2020 and thereby involved only a 15-month COVID-19 time period. In addition, the comparison of the same number of months before and during COVID-19 would decrease the sample size to 30, which, in turn, would affect the statistical power of the study and thus possibly, would not allow us to detect statistically significant differences (see Bernal et al., 2017; Zhang et al., 2011). The imbalance did not allow us to make a robust comparison before and during COVID-19 to ascertain the relationship between COVID-19 and the outcomes and to obtain robust results, however (see Zhang et al., 2011). Future studies should thus include more data concerning incidents during the COVID-19 period and the impact of COVID-19 on the same outcomes. Although pre-COVID-19 served as its own control, using a different city as a control group (i.e., a city not impacted by COVID-19) would increase the internal validity of the results (see Sherman et al., 1998) by providing for counterfactual factors (i.e., what would happen had COVID-19 not occurred). However, it is very difficult to find a city that was not impacted by COVID-19 and was similar to the city explored in the current study.

Despite these limitations, the findings are important in helping researchers to better understand the effect of COVID-19 on domestic violence and assaults. In this regard, the present study has shown that COVID-19 decreased domestic violence and assaults in the geographic area studied.


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### Notes

1. The obtained trend formula was  $y = -0.0596x + 17.094$  for domestic violence arrests,  $y = -0.0366x + 17.681$  for assault arrests,  $y = -0.1336x + 61.11$  for domestic violence calls, and  $y = -0.0375x + 20.793$  for assault calls.
2. Goodness-of-fitness tests showed that Poisson regression test was appropriate to use for each model. The results were not reported.
3. Autocorrelation refers to similarity between observations. Observations must be independent from each other to accurately estimate the results (see Fox, 1991).
4. The formula used to convert IRR percentage is as follows:  $(IRR \text{ value} - 1) * 100$

5. The control variable “month” was included in the analyses for each outcome (i.e., domestic violence calls, domestic violence arrests, assault calls, and assault arrests), but the results are not shown in Table 3.

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