

# **Fenway and Crime: Opportunity, Geographic Differences, and Team Rivalry at Boston Red Sox Games**

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## **Abstract:**

Although hosting professional sports are often seen as a financial benefit for cities, there are also associated costs. This paper investigates the possibility of interdependence between a variety of crimes and home game days of the Boston Red Sox. When adjusting for game attendance and length, minor assaults charges such as disorderly conduct and simple assault increase city-wide during game days. Despite this, all crime around the immediate stadium area decreases in volume. Additionally, this study examines differences in geographical impacts and crime levels, when a game was played, and games played against the New York Yankees, their historic rival.

JEL Classification: L83, R23, Z21

Keywords: baseball, MLB, Boston, crime, team rivalry

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## 1.0 INTRODUCTION

While Major League Baseball (MLB) has generally been seen as a family friendly sport, not many previous studies have not investigated the link between crime and hosting a professional baseball game. Several studies, however, have linked football and soccer to increasing crime rates. This gap in literature could be the result that baseball is considered a family friendly spectator sport and not associated with rioting sometimes seen during soccer or college football games (Seff, 2015). However, MLB games may result in an increase in crime due to a larger attendance and increased opportunity.

This study aims to enhance the overall understanding of professional sports impact on crime rates. From a policy perspective, this analysis is important because could lead to better crime prevention policies and programs to reduce crime caused by sports. Using nearly five years of daily data from Boston, MA, we examine how crime rates are likely to change in Boston during Red Sox game days.

Crimes are examined based on likely perpetrators (disorder offenses) and likely victims (pecuniary offenses). An opportunity variable also considers attendance and game length in attempts to measure the elasticity of the crime during game time. Results indicate that Boston Red Sox games are likely responsible for increases in all common crime rates in Boston by 2.38%, Disorderly Conduct by 18.95%, and Simple Assault Charges by 6.67%. When analyzing the impact by district, all crime in the districts surrounding Fenway Park decreased by 1.5%. Robbery also decreases by 6.5%, and Burglary by 16.8% in the immediate stadium area. When playing against teams that aren't the New York Yankees, city-wide crime reduces by 0.95% and Burglary also decreases by 4.31%. Day games reduce city-wide Burglary by 4.94%.

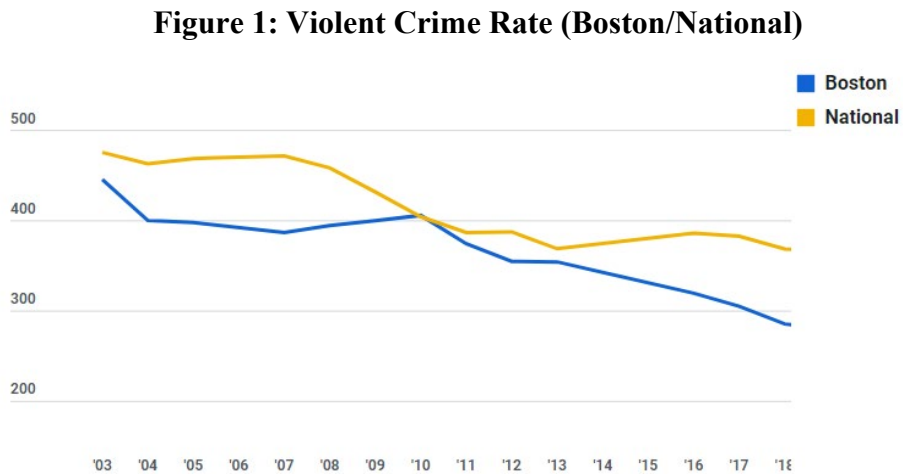
This paper was guided by three research objectives: First it investigates the possibility of interdependence between game days and city-wide crime using time-series data; Second, it incorporates the opportunity-proxy model to examine the influence of location on crime; We also utilize the opportunity-proxy model to examine the impact of games against rival teams and the time of the games impact on city-wide crime. Although there has been similar

empirical work done in the past, no previous literature has examined a city with such a relatively low crime rate such as Boston. This paper successfully fills this void.

The rest of the paper is organized as follows: Section 2 provides an overview of trends. Section 3 gives a brief literature review. Section 4 outlines the empirical model, data, and estimation methodology. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

## 2.0 TRENDS OF BOSTON CRIME

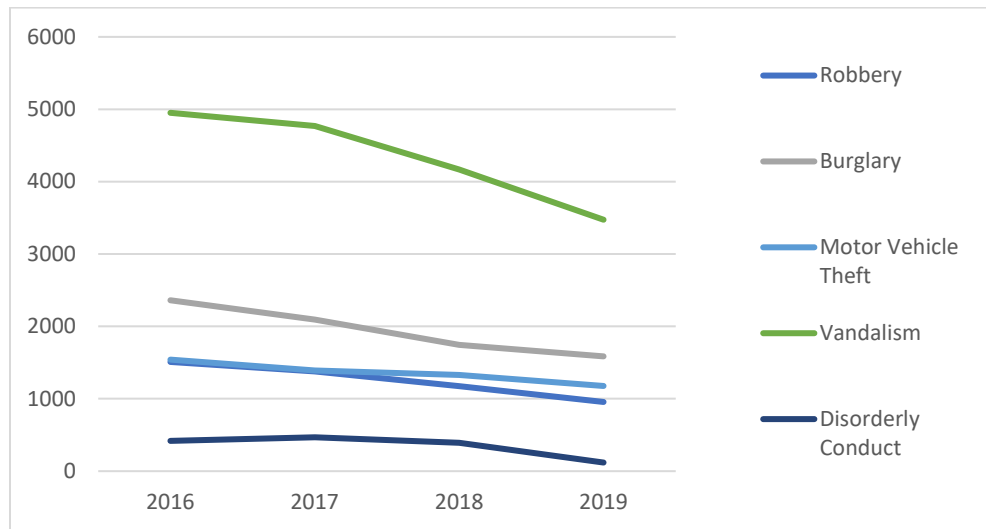
Figure 1 shows that from 2003 to 2018, the crime rate in Boston has been on a clear downward trend with a significant decrease in the number of violent crimes. Although the national crime rate has also decreased during the same period, Boston's crime rate has dropped relatively more. According to the Boston Police Department, the city's crime rate has dropped more than 25% since 2010. In contrast, the national crime rate has only decreased by less than 10% since. The decrease in the national crime rate can likely be attributed to improving economic conditions reducing poverty. The decrease in Boston can likely be attributed to increased policing efforts throughout the city.



Source: Federal Bureau of Investigation's Uniform Crime Reports

Figure 2 shows that from 2016 to 2019, crime rates in Boston for some of the UCF Part I crimes such as Robbery, Burglary, Motor Vehicle Theft, Vandalism, and Disorderly Conduct have been massively trending downward. Since 2016, Robbery has decreased by 36.6%, Burglary by 32.7%, Motor Vehicle Theft by 23.6%, Vandalism by 29.8%, and Disorderly Conduct by 71.6%. Property crime in Boston has been occurring at a decreasing rate.

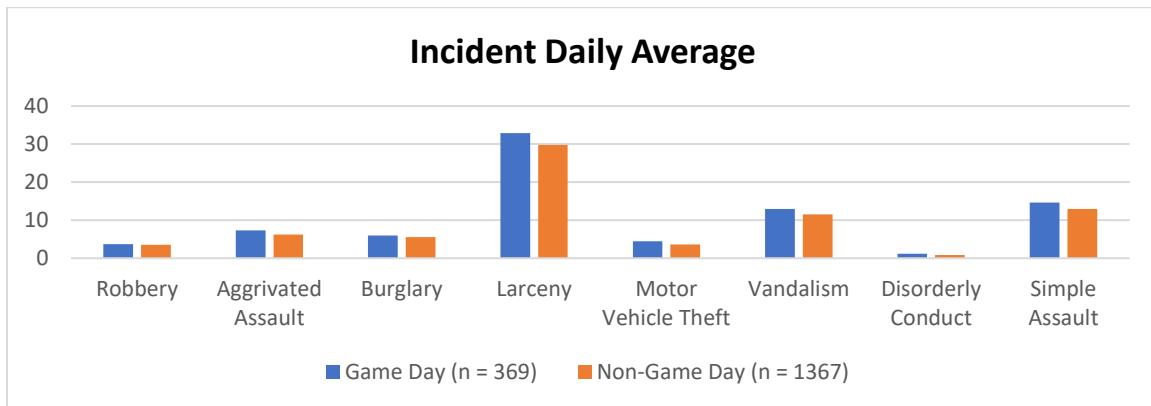
**Figure 2: Boston Yearly Crime Totals**



Source: Boston Police Department

Figure 3 shows that from 2015 to 2020, the incident daily average for all crimes in Boston are higher on game days. Although Boston's crime rate has decreased significantly over the past decade, the city still faces significant challenges in reducing crime. For example, some districts have historically experienced higher levels of violence. Crime rates can also vary widely from one year to the next. As a result, it is important to examine long-term trends to get a more accurate picture of the overall trajectory of crime in each area.

**Figure 3: Incident Daily Average (Game Day/Non-Game Day)**



Source: Boston Police Department

### 3.0 LITERATURE REVIEW

The relationship between sports and higher levels of crime can be explained by the team rivalry, alcohol consumption, disappointment over the game result, and an increased opportunity to commit during game times. When examining previous literature, violent crimes and aggressive behavior have been connected to European soccer. Ward (2002) suggests that the lower levels of violence in the United States are result of the lower popularity of soccer and a more diverse base of spectators. Marie (2016) finds a significant relationship between attendance and crime, with about a 4% increase in crime for each 10,000 attendees at a soccer match. In European soccer, a fan's allegiance to a team is typically determined by where they grew up or familial ties. Since professional teams in the United States typically have a shorter history when compared to European soccer and don't have as much of a local pull when compared to soccer. Roberts and Benjamin (2000) state that, "The idea of Manchester United being 'sold' to another city is unthinkable in the United Kingdom". However, teams are frequently sold in the United States.

Although the lack of deep team rivalries in the United States may be an outcome of the mobility of professional sports teams, violence and aggression have still been common enough make policing at sports events extremely challenging (Madensen & Eck, 2008). Roberts and Benjamin (2000) also believe that sports with highly violent player behavior

reflect onto their spectators. For example, sports such as American football and hockey in the United States are often seen to have high levels of unpunished violence on the field. Whereas European soccer or basketball games highly regulate violent player behavior. Since baseball is a sport that highly regulates violent player behavior, we should expect to see less assault charges at MLB games when compared to other sports. On the other hand, MLB games may yield higher rates of aggressive spectator behavior because baseball is one of the oldest professional sports in the United States. Baseball is considered to be “Americas Game” and many teams in the MLB have historical roots dating before the 19th century. This makes it by far the oldest popular sport in the United States. Only a limited amount of MLB teams relocate when compared to other leagues like the NFL or NBA, which may explain why higher levels of historical team rivalries exist in the MLB. Due to this high amount of team rivalry in MLB, we should expect to see higher crime rates on games played against a rival team.

When examining the levels of alcohol consumption at sports games, there has been an established connection between alcoholic intake and increased criminal behavior. Some increased behavior includes assaultive behavior, property damage, and vandalism (Boden, Fergusson, & Horwood, 2013; Ostrowsky, 2014). Card and Dahl (2011) also find that crime may not just increase in the immediate stadium area, but that spectators in a variety of locations may be impacted due to a big win or loss. One sample found that 60% of males ages 20-35 at an MLB are likely to show evidence of alcohol consumption. By the fifth inning, 13% were legally impaired (Wolfe, Martinez, & Scott, 1998). When combining this information with evidence of excessive alcohol consumption leading to lower self-control and the large amount of people in a concentrated area, we should expect to see an increased rate of aggressive behavior at MLB games.

Cohen and Felson in 1979 developed the Routine Activities Theory (RAT). RAT useful to explain the framework of the opportunity for crime. Despite declining poverty rates in the 1970s, property offenses in the United States increased. Homes were becoming increasingly suitable targets for burglaries as supervision was reduced. This is a result of an increased female participation in the labor market, reducing neighbor supervision.

According to Cohen and Felson (1979), crimes occur when three elements are fulfilled: there is a motivated offender, a suitable target, and a lack of supervision. The likelihood of crime occurring can change depending on the supply of opportunities. Relating this information to professional sports games, the supply of suitable targets increases as their property is unsupervised. MLB teams average around 30,000 spectators per game and the majority travel by vehicle (Humphreys & Pyun, 2018). Vehicles likely sit concentrated in parking garages and unattended during games. Those who arrive late often must park on side streets and areas with even less supervision. Spectators who live outside the area may not be very familiar with local crime patterns. Many attendees may not take typical precautions that many locals may take, such as putting valuables out of sight. The average MLB game lasts over 3 hours and parking garages and streets heavily unsupervised. All these factors make spectators at MLB games suitable targets to be victims of crime.

Although Baumann, Ciavarra, Englehardt, and Matheson (2012) found no evidence of professional sports teams leading to increased property or violent crimes, prior studies have found that robberies increase during NBA games and street crimes focused on pecuniary gain are likely to increase because a greater number of targets present themselves in a highly concentrated area. (Yu, McKinney, Caudill, & Mixon, 2016). We also must consider the time at which the game is played. Games played during evening hours may provide an increase in opportunities due to the darkness reducing supervision. This will likely increase the rate for property offenses, but likely won't impact fan behavior. Alcohol use can also increase the risk of theft as it reduces a person's situational awareness. All these factors may lead them to become easy victims of theft or robbery. Rees and Schnepel (2009) concluded that home College football games are associated with a 9% increase in Assaults, 18% increase in Vandalism, 13% increase in DUI's, and a 41% increase in Disorderly Conduct charges. However, away games did not significantly affect local crime levels. As a result, we should expect that property offenses, especially those focused on vehicles, are likely to increase during MLB game days.

It is important to note that the Red Sox provide additional security by hiring off-duty police officers and the city increases supervision around the stadium during game days, especially

against rival teams. Even an increase in crime around the stadium may not lift city crime levels if local offenders purposively travel to the stadium area to commit offenses. As a result, it will require a substantial increase in crime around the stadium area on game days to significantly change citywide crime levels in a big city such as Boston. Overall, we expect that property crime levels (such as larceny and motor vehicle theft) and minor aggressive offenses directly around Fenway Park will increase during game days.

## **4.0 DATA AND EMPIRICAL METHODOLOGY**

### **4.1 Data**

The study uses annual data time-series data from 2015 to 2020. Boston daily crime data was collected from Boston Police Department of Innovation and Technology. Data was collected as far back as they offered (June 15<sup>th</sup>, 2015) to the date before the United States lockdown for COVID-19 (March 13<sup>th</sup>, 2020). The Boston Police Department uses Uniform Crime Reporting (UCR) to ensure a degree of consistency in recording crime. All major crime categories (Part I crimes) were examined in this study as they report a reasonable daily frequency. For example, homicide is not considered to be a part of Part I crimes as they rarely occur at a daily level. All Part I crimes include robbery, aggravated assault, burglary, larceny, and motor vehicle theft, simple assault, disorderly conduct, and vandalism.

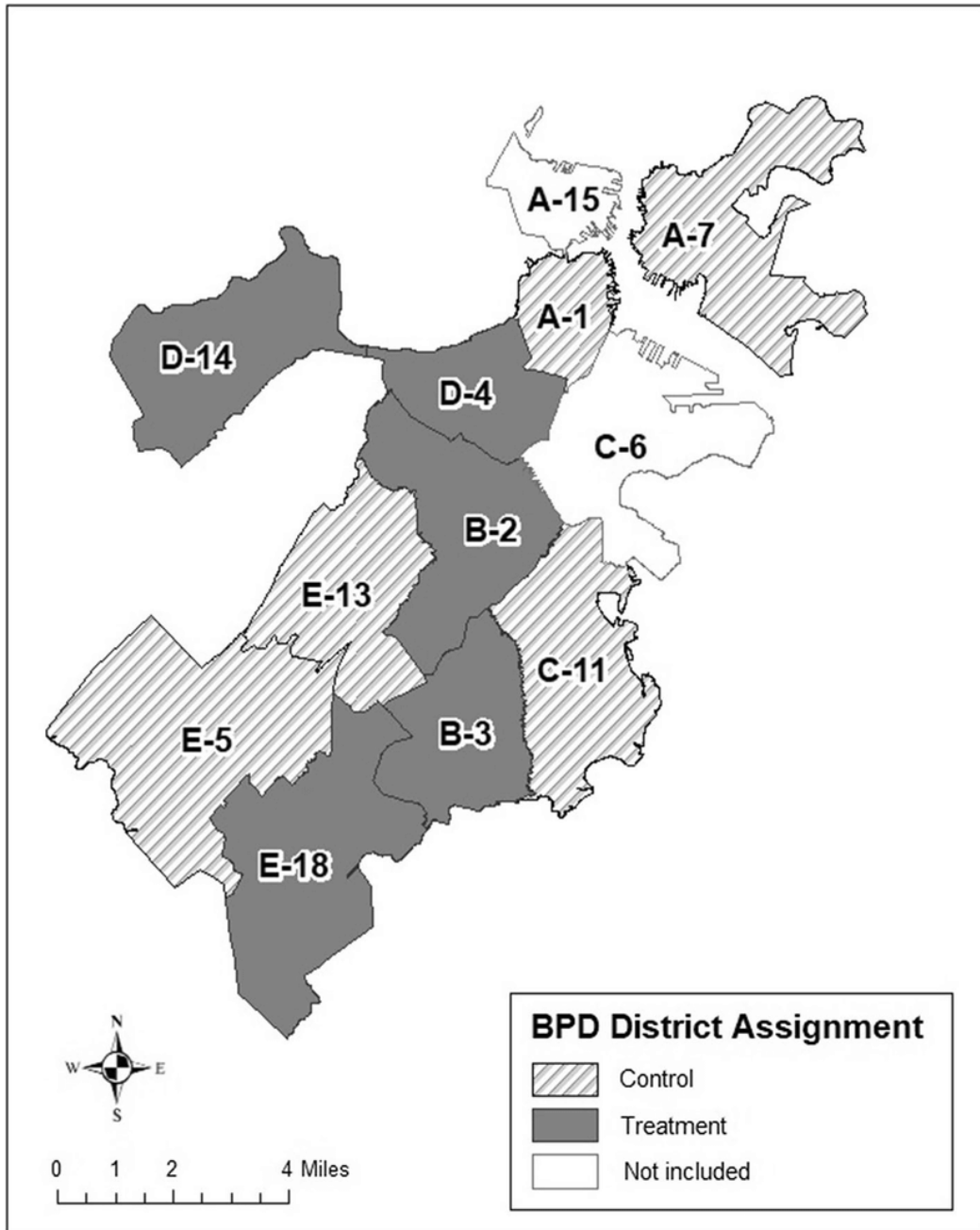
Boston was mainly selected due to the availability of their data. However, they have a relatively low crime rate when compared to other major cities. Although another study has analyzed the impact on a city with high crime rates, St. Louis, nobody has analyzed a city with lower crime rates to compare results. The Boston Red Sox are one of the main teams in the MLB due to their long history and loyal local fan base. This ensures a consistent high attendance and heated rivalry games against the New York Yankee's. The average attendance at Red Sox games is slightly above 36,000 per game.

Instead of using distance bands, we group crime into four categories based on their relationship to Fenway Park: Fenway, Near Fenway, City Center, and City-Wide. Crime will be grouped into Fenway if it occurs in Fenway/Kenmore (D-4). Near Fenway if it



occurs in Allston/Brighton (D-14), Mason Hill/Roxbury (B-2), South Boston (C-6), and City Center (A-1). City center if occurs in A-1 and all districts if occurred city-wide. See [Figure 4](#) for more information on district layouts in Boston.

**Figure 4: Boston District Map**



Source: ResearchGate

The Red Sox play schedule was retrieved from Baseball-Reference as they post historical MLB schedules (<https://www.baseball-reference.com>). Included are the game dates, the name of the opposing team, whether a play occurred home or away, whether the game was played at day or night, attendance numbers, and game duration. Both regular season and postseason games are included. Home game days for the two other professional sports teams in Boston, the Celtics (NBA) and the Bruins (NHL) act as control variables. We generated binary variables for all home games for MLB, NHL and NFL games.

Because previous studies have found that daily crime counts are impacted by climatic variation such as Cohn & Rotton (2000), the current study includes a variety of weather data such as precipitation, snowfall, temperature, windspeed, hail, fog, and thunder. Daily climate data was collected from the National Oceanic and Atmospheric Administration at Boston Logan International Airport. Logan is located roughly 5.6 miles away from Fenway Park and has some of the most accurate weather data in the region.

Additional control variables are generated to account for time-varying influences on crime. Most daily crime studies incorporate binary indicators for federal holidays such as Cohn & Rotton (2003). Summary statistics for the data are provided in [Table 1](#).

**Table 1 Summary Statistics**

Variable	Observation	Mean	Std. Dev.	Min	Max
Opportunity	454	7.21	1.467	4.73	16.82
RedSoxHome	1738	0.212	0.409	0	1
CelticsHome	1738	0.010	0.101	0	1
BruinsHome	1738	0.127	0.333	0	1
Precipitation	1738	0.118	0.294	0	2.7
Snowfall	1738	0.107	0.786	0	14.5
Temperature	1738	47.416	15.947	0	108
Temperature2	1738	2502.449	1475.542	0	11664
Windspeed	1738	11.059	3.827	3.2	38.1
Hail	1738	0.005	0.072	0	1
Fog	1738	0.083	0.276	0	1
Thunder	1738	0.047	0.212	0	1
Holiday	1738	0.031	0.174	0	1
AllP1	1738	73.932	15.62	0	133
Robbery	1738	3.534	2.15	0	12
Aggravated Assault	1738	6.473	2.99	0	23
Burglary	1738	5.665	3.06	0	20
Larceny	1738	30.372	7.70	0	58
Motor Vehicle Theft	1738	3.819	2.27	0	14
Vandalism	1738	11.845	4.72	0	35
Disorderly Conduct	1738	0.939	1.08	0	8
Simple Assault	1738	13.285	4.48	0	39

## 4.2 Empirical Model

The analytical strategy of this study rests on time-series modeling. The distribution of crimes counts in our data was nonnormal due to the low frequency at which crimes occur on a daily level. Since most of the variables have a higher standard error when compared to their mean, a Negative Binomial Generalized Linear Model (GLM) employing a log link must be used instead of a traditional OLS regression.

We modify Mare & Blackburn's (2019) model on baseball affecting citywide crime as shown:

$$\ln E(\text{crime}_t) = \tau_t + \beta_0 + \beta_1 \text{RedSoxHome}_t + \beta_2 \text{CelticsHome}_t + \beta_3 \text{BruinsHome}_t + \beta_4 \text{Precipitation}_t + \beta_5 \text{Snowfall}_t + \beta_6 \text{Temperature}_t + \beta_7 \text{Temperature}^2_t + \beta_8 \text{Windspeed}_t + \beta_9 \text{Hail}_t + \beta_{10} \text{Fog}_t + \beta_{11} \text{Thunder}_t + \beta_{12} \text{Holiday}_t + \varepsilon.$$

The equation above describes that the expected level of crime at day (t) is the predicted outcome of: Binary variables for Boston Red Sox home games (RedSoxHome), Boston Celtics home games (CelticsHome), and Boston Bruins home games (BruinsHome). Weather controls such as precipitation (in), snowfall (in), temperature (F), a squared temperature term to account for the nonlinear effects of temperature, and windspeed (MPH). Lastly, binary variables that may impact game attendance (hail, fog, thunder). Federal holidays are also included as per Cohn & Rotton (2003).

Mare & Blackburn's (2019) study also include an opportunity variable in attempts to capture the elasticity of crime:

$$\text{Opportunity}_t = \text{home game day} \left( \frac{(\text{attendance} \times \text{game length})}{1,000,000} \right). \quad (2)$$

The goal of the opportunity variable is to capture the changing crime opportunities on a game day (t) which are measured as the result of which the Red Sox either play at home (1) or do not play a home game (0) multiplied by attendance and game length (in minutes). Although not every additional attendee or minute of game creates an actual crime opportunity, it may increase the chance of a crime being committed. Although output is not listed due to the lack of significant results, models for [Table 2](#) were also run using the opportunity variable.

## **5.0 EMPIRICAL RESULTS**

The empirical estimation results for game days and city-wide crime are presented in [Table 2](#). The empirical estimation shows that when the Red Sox play at home, city-wide common crime rates in Boston increase by 2.38% with significance at the 5% level, Disorderly Conduct increases by 18.95% with significance at the 1% level, and Simple Assault Charges by 6.67% with significant at the 1% level.

**Table 2: Game Day and City-Wide Crime**

Dependent Variables	All Part 1 Crimes	Robbery	Aggravated Assault	Burglary	Larceny	Motor Vehicle Theft	Vandalism	Disorderly Conduct	Simple Assault
RedSoxHome	0.0237 (0.0116)**	-0.0284 (0.0391)	0.0377 (0.0275)	-0.0452 (0.0335)	0.0122 (0.0148)	0.035 (0.0354)	0.0246 (0.0246)	0.1895 (0.0699)***	0.0667 (0.0205)***
CelticsHome	-0.0777 (0.0445)*	-0.1422 (0.1567)	-0.0607 (0.1059)	-0.1153 (0.1345)	-0.1475 (0.0587)**	-0.0611 (0.1429)	0.0252 (0.0922)	-0.1735 (0.2765)	-0.0067 (0.0753)
BruinsHome	0.0065 (0.0136)	0.0019 (0.046)	0.0176 (0.0335)	-0.0543 (0.0407)	0.0271 (0.0174)	-0.0204 (0.0449)	-0.0353 (0.0294)	-0.0409 (0.0903)	0.027 (0.0247)
Precipitation	-0.0595 (0.017)***	0.0291 (0.0561)	-0.0913 (0.0421)**	0.0116 (0.0459)	-0.0514 (0.0219)**	-0.0287 (0.0544)	-0.1114 (0.0366)***	0.0093 (0.1041)	-0.0926 (0.0317)***
Snowfall	-0.0253 (0.0066)***	0.0005 (0.0218)	-0.0111 (0.017)	-0.0354 (0.0212)*	-0.0437 (0.0092)***	0.0272 (0.0207)	-0.0149 (0.0139)	-0.0141 (0.0428)	-0.0353 (0.0129)***
Temperature	0.0099 (0.0015)***	0.0139 (0.0053)** *	0.0167 (0.0039)***	0.0092 (0.0045)**	0.0072 (0.0019)***	0.0019 (0.0049)	0.0135 (0.0033)***	0.0305 (0.0108)***	0.0116 (0.0028)***
Temperature2	-0.00004 (0.00001)***	-0.0001 (0.0001)*	-0.0001 (0.0001)**	-0.0001 (0.0001)	-0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)**	0.0002 (0.0001)**	0.0001 (0.0001)***
Windspeed	-0.0028 (0.0012)**	-0.0072 (0.0041)*	-0.0046 (0.003)	-0.0059 (0.0035)*	-0.0053 (0.0015)***	-0.0107 (0.0039)***	0.0041 (0.0026)	0.0031 (0.0078)	0.0017 (0.0022)
Hail	-0.0928 (0.0637)	-0.0507 (0.2135)	0.1199 (0.1518)	0.0362 (0.1535)	-0.123 (0.054)	-0.2535 (0.2347)	-0.226 (0.1446)	-0.5539 (0.5276)	-0.0147 (0.116)
Fog	-0.0124 (0.0174)	-0.0551 (0.0592)	0.0171 (0.0418)	-0.0516 (0.051)	-0.0035 (0.0222)	-0.1577 (0.0572)***	0.0306 (0.0365)	0.0743 (0.1071)	-0.0123 (0.0319)
Thunder	-0.0935 (0.022)	-0.0323 (0.0741)	-0.0552 (0.0559)	-0.0419 (0.0635)	-0.0051 (0.028)	-0.0369 (0.0672)	-0.0045 (0.0466)	0.0592 (0.1314)	0.0072 (0.0399)
Holiday	-0.0995 (0.0255)***	-0.0557 (0.056)	0.1004 (0.0559)*	-0.2193 (0.0783)***	-0.1922 (0.034)***	-0.0251 (0.0502)	0.0073 (0.0532)	0.0505 (0.1564)	-0.0655 (0.0701)

Note: \*\*\*, \*\*, and \* denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

The empirical estimation results for game days and geographic crime differences are presented in [Table 3](#). The empirical estimation shows that all crime in the districts surrounding Fenway Park decreased by 1.5% with significance at the 10% level. Robbery also decreases near Fenway by 6.5% with significance at the 10% level. Burglary

decreases by 16.8% in the immediate stadium area with significance at the 10% level. Other significant variables include Celtics games reducing city-wide crime by 7.78% with significance at the 10% level and city-wide Larceny by 14.75% with significance at the 5% level. All weather variables showed some form of significance with worse weather decreasing crime rates. Lastly, federal holiday's decreases the likelihood of property crimes such as Burglary and Larceny.

**Table 3: Geographic and Crime Differences, Game Day Coefficients Only**

Dependent Variables	Fenway	Near Fenway	City Center
All Part 1 Crimes	-0.0130 (0.0114)	-0.0155 (0.0081)*	-0.0154 (0.0147)
Robbery	0.0112 (0.0492)	-0.0658 (0.0357)*	0.0102 (0.058)
Aggravated Assault	-0.0559 (0.0475)	-0.0068 (0.0244)	-0.0274 (0.0516)
Burglary	-0.1681 (0.0662)**	-0.0442 (0.0289)	-0.0671 (0.0721)
Larceny	0.0159 (0.0147)	-0.0199 (0.0124)	-0.0303 (0.0193)
Motor Vehicle Theft	-0.0609 (0.0583)	0.0086 (0.0345)	0.0365 (0.0667)
Simple Assault	0.0374 (0.0252)	-0.0053 (0.0164)	-0.0094 (0.031)
Vandalism	0.0206 (0.034)	-0.0027 (0.0197)	0.0153 (0.0411)
Disorderly Conduct	-0.0661 (0.0861)	-0.0032 (0.0568)	0.0912 (0.0735)

Note: \*\*\*, \*\*, and \* denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

The empirical estimation results for game days and geographic crime differences are presented in [Table 4](#). The empirical estimation shows that when playing against teams that aren't the New York Yankees, city-wide crime in Boston reduces by 0.95% with significant at the 10% level. Burglary also decreases city-wide by 4.31% with significant at the 10% level. These estimates are inconsistent with Mare & Blackburn's (2019) results as crime in the immediate area around the stadium is expected to increase.

**Table 4: Team Rivalry—Red Sox Versus Yankee's—Game Day Coefficients Only.**

Dependent Variables	All Part 1 Crimes	Robbery	Aggravated Assault	Burglary	Larceny	Motor Vehicle Theft	Simple Assault	Vandalism	Disorderly Conduct
Yankee's	0.0131 (0.0118)	.0044 (.0557)	-0.0226 (0.0429)	-0.0144 (0.047)	0.0212 (0.0198)	-0.0262 (0.0534)	0.0225 (0.0286)	0.0426 (0.0286)	-0.2103 (0.1311)
Other teams	-0.0095 (0.0055)*	-.0397 (.0255)	-0.0016 (0.0166)	-0.0431 (0.0221)*	-0.0127 (0.008)	0.0045 (0.0224)	0.0066 (0.0117)	-0.0069 (0.0148)	-0.0017 (0.043)

Note: \*\*\*, \*\*, and \* denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

The empirical estimation results for game days and geographic crime differences are presented in [Table 5](#). The empirical estimation shows that day games reduce city-wide Burglary by 4.94% with significant at the 10% level. This estimate is inconsistent with previous literature as there are a lack of significant connecting night games to increased property crime.



**Table 5: Time of Day—Night Versus Day Games—Game Day Coefficients Only.**

Dependent Variables	All Part 1 Crimes	Robbery	Aggravated Assault	Burglary	Larceny	Motor Vehicle Theft	Simple Assault	Vandalism	Disorderly Conduct
Day game	-0.0057 (0.0088)	-0.0516 (0.0441)	0.0060 (0.0282)	-0.0494 (0.0299)*	0.0011 (0.0129)	0.0056 (0.0362)	0.0109 (0.0182)	-0.0112 (0.0232)	-0.1079 (0.0781)
Night game	-0.0083 (0.006)	-0.0274 (0.0268)	-0.0063 (0.0188)	-0.0419 (0.0262)	-0.0155 (0.0094)	0.001 (0.0254)	0.0067 (0.0133)	0.0059 (0.0161)	0.0226 (0.0479)

Note: \*\*\*, \*\*, and \* denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

## 6.0 CONCLUSION

Although our study did not find significant evidence, such as Mare & Blackburn’s (2019) study, that home games result in an increase of expected property crimes, we did find a significant relationship between home games resulting in an increase of expected minor assault charges (Disorderly Conduct and Simple Assault). Boston also had a much lower expected increase in common crime when compared to Mare & Blackburn’s (2019) study performed on St. Louis (15%).

Policy to reduce MLB games impact on crime should focus primarily on crowd control in the immediate stadium area to reduce the Disorderly Conduct and Simple Assault charges around the stadium. Regulations related to alcohol sales at games will likely reduce the likelihood of minor assault charges. We also echo Mare and Blackburn’s (2019) recommendations on increasing surveillance on parked vehicles since they appear to be at especially high-risk during games. Alerting spectators to park vehicles in well-supervised areas and to hide personal belongings may decrease property crimes on game days.

The main limitation of this study relates to the credibility of city-wide results. Boston is a large city that constantly hosts other events that could result in increases in crime. Trying to account for all variables affecting city-wide crime is nearly impossible and must be

assumed to occur randomly on game days and non-game days. As a result, the true impact of MLB games on crime could be much higher as analyzing the city-wide impact can reduce game effects to such small levels. Another limitation of the study is that cities and MLB teams and cities keep their police and security staffing private, so including it as a control variable is nearly impossible. However, we do know that the Boston Red Sox increase security on game days, especially for rival games against the Yankee's.

Although more analysis is needed, Boston's lack of an increase in property crimes on game days is likely result of having stronger surveillance over personal property and should be strived to be replicated in other major cities.

### Appendix A: Variable Description and Data Source

Acronym	Description	Data source
Opportunity	Proxy variable calculated based on game attendance & length	Calculated based on attendance & game length data from Baseball-Reference
RedSoxHome	Binary variable for when Boston Red Sox play at Fenway Park	Baseball-Reference
CelticsHome	Binary variable for when Boston Celtics play at TD Garden	Basketball-Reference
BruinsHome	Binary variable for when Boston Bruins play at TD Garden	Hockey-Reference
Precipitation	Daily precipitation in inches	National Oceanic and Atmospheric Administration
Snowfall	Daily snowfall in inches	National Oceanic and Atmospheric Administration
Temperature	Daily average temperature	National Oceanic and Atmospheric Administration
Temperature2	Squared temperature term	Calculated based on data from the National Oceanic and Atmospheric Administration
Windspeed	Daily average windspeed in miles per hour	National Oceanic and Atmospheric Administration
Hail	Binary variable for when hail occurs	National Oceanic and Atmospheric Administration

Fog	Binary variable for when fog occurs	National Oceanic and Atmospheric Administration
Thunder	Binary variable for when thunder occurs	National Oceanic and Atmospheric Administration
Holiday	Binary variable for if the day is a Federally recognized Holiday	US Department of Commerce
AllP1	Crimes of reasonable daily frequency: Robbery, Aggravated Assault, Burglary, Larceny, Motor Vehicle Theft, Vandalism, Disorderly Conduct, and Simple Assault	Boston Police Department of Innovation and Technology
Robbery	Taking of property unlawfully	Boston Police Department of Innovation and Technology
Aggravated Assault	Unlawful attack of one person on another	Boston Police Department of Innovation and Technology
Burglary	Unlawfully entry into a building with intent to commit a crime	Boston Police Department of Innovation and Technology
Larceny	Theft of personal property	Boston Police Department of Innovation and Technology
Motor Vehicle Theft	Theft of a motor vehicle	Boston Police Department of Innovation and Technology
Vandalism	Deliberate destruction of public property	Boston Police Department of Innovation and Technology
Disorderly Conduct	Disturbing the peace; attempt to cause public alarm	Boston Police Department of Innovation and Technology
Simple Assault	Causing physical harm to another person	Boston Police Department of Innovation and Technology

## **BIBLIOGRAPHY**

Baumann, R., Ciavarra, T., Englehardt, B., & Matheson, V. (2012). Sports Franchises, Events, and City Livability: An Examination of Spectator Sports and Crime Rates. *The Economic and Labour Relations Review*, 23(2), 83-97.

Boden J. M., Fergusson D. M., Horwood L. J. (2013). Alcohol misuse and criminal offending. *Drug and Alcohol Dependence*, 128, 30–36.

Cohen L., Felson M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, 44, 588–608.

Cohn E. G., Rotton J. (2003). Even criminals take a holiday. *Journal of Criminal Justice*, 31, 351–360.

Card D, Dahl G. (2011). Family Violence and Football: The Effect of Unexpected Emotional Cues on Violent Behavior. *The Quarterly Journal of Economics*, 126(1), 103–143.

Humphreys B. R., Pyun H. (2018). Professional sports and traffic congestion: Evidence from US cities. *Journal of Regional Science*.

Madensen T. D., Eck J. E. (2008). *Spectator violence in stadiums*. Washington, DC: Office of Community Oriented Policing Services (COPS).

Marie O. (2016). Police and thieves in the stadium: Measuring the (multiple) effects of football matches on crime. *Journal of the Royal Statistical Society: Series A*, 179, 273–292.

Ostrowsky M. R. (2014). The social psychology of alcohol use and violent behavior among sports spectators. *Aggression and Violent Behavior*. 19, 303–310.

Roberts J. V., Benjamin C. J. (2000). Spectator violence in sports: A North American perspective. *European Journal on Criminal Policy and Research*. 8, 163–181.

Rees, D. I., and Schnepel, K. T. (2009). College Football Games and Crime. *Journal of Sports Economics*. 10(1), 68–87.

Seff M. (2015) 20 Reasons why baseball is better than football. Draft America. <http://draftamerica.com/20-reasons-why-baseball-is-better-than-football/>

Ward E. R. (2002). Fan violence. Social problem or moral panic? *Aggression and Violent Behavior*. 7, 453–475.

Wolfe J., Martinez R., Scott W. A. (1998). Baseball and beer: An analysis of alcohol consumption patterns among male spectators of major league sporting events. *Annals of Emergency Medicine*, 31, 629–632.

Yu Y., Mckinney C. N., Caudill S. B., Mixon F. G. (2016). Athletic contests and individual robberies: An analysis based on hourly crime data. *Applied Economics*. 48, 723–730.