

An Analysis of National Hockey League Playoff Games and City-Level Crime Counts

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Abstract

Past research indicates that when professional sports games are played, crime increases. Yet, little is known about how playoff games affect crime. As many criminal events associated with sports games, such as riots, occur during playoff games, this is an important gap in the literature. Using data from 15 National Hockey League (NHL) teams from 2013 through 2019, we examine how assault, disorder, and property crimes change when playoff games are played at home relative to when they are played away. We find that during home games there are 7% more disorder crimes and 4% more property crimes than during away games which suggests that city responses to playoff hockey games should prioritize crime reduction strategies to improve public safety.

Keywords: Hockey, Crime, Routine Activities Theory, Sports and Crime

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Introduction

Professional sports games have long been given an elevated status in the United States, playing a major role in both youth and adult athleticism and entertainment (Burns, 2019; Huettermann et al., 2019; Wann, 1995). During the early months of the COVID-19 pandemic many businesses were ordered to shut down by government rules that intended to prevent even small numbers of people from congregating (Byrnes, 2020). One of the few exceptions to these rules, however, were professional sports games that were still allowed to take place - albeit without spectators. Given the prominence of professional sports in American entertainment and culture, a growing body of research has sought to examine how sports affect public safety. These studies have broadly found that when professional sports games are played at home there is a small, but statistically significant increase in crime in that home team's city (Breetzke & Cohn, 2013; Yu et al., 2016; Kurland et al., 2018; Mares & Blackburn, 2019; Block, 2021).

One reason why sports games could contribute to increased crime is because they cause large crowds of people, both at and around the stadiums that the games are played in and at local bars that air the games on TV. With large groups of people come an increased number of potential targets and offenders, two of the three elements needed for a crime to occur, according to Cohen & Felson (1979)'s Routine Activities Theory. The third element, the absence of a capable guardian might also occur if there is not adequate security in and around the stadium and popular sports bars. Additionally, if spectators are under the influence of alcohol, they could be inebriated to the point in which they are unable to protect themselves and their belongings from potential offenders. This is because alcohol consumption impairs attention (Loeber et al., 2009), speed of information processing (Bartholow et al., 2003), and awareness of one's surroundings (Sayette, 2017).

Indeed, a robust body of research does find that acute alcohol consumption contributes to increased crime (Bromley & Nelson, 2002; Richardson & Budd, 2003; Leonard & Quigley, 2017) and those individuals who consume alcohol are more likely both to be offenders and victims of criminal activity (Parks & Fals-Stewart, 2004; Rothman et al., 2012; Hammerton et al., 2017; Chalfin et al., 2019). Furthermore, sports spectators are known to consume alcohol as they watch games (Eastman & Land, 1997). As for the relationship between alcohol, sports, and crime, one study found that alcohol sales positively predicted crime at university sports games (Menaker & Chaney,

2014). Another, more recent study found that alcohol consumption during professional baseball games in Philadelphia is directly associated with increased violent crime (Klick & MacDonald, 2021).

The majority of past research assessing the relationship between sports and crime only includes regular season or a combination of regular season and playoff games (Block, 2021; Kurland & Piza, 2018; Rees & Schnepel, 2009; Yu et al., 2016), which limits our understanding of sports and crime. As many of the major criminal disturbances - such as riots - associated with professional sports games happened during playoff game days, this is an important gap in the literature. These riots have happened following playoff professional football (Lardieri, 2018), professional baseball (Blau, 2016; Rocha, 2014), and professional basketball games (McGraw, 1990; Rosenfeld, 1997; Allen & Linthicum, 2010), but occur most commonly after professional hockey playoff games (Furlong & Keefe, 2011; Canadian Press, 2011; Sawyer, 2021). However, to date, there is relatively sparse research into crimes during and immediately after professional sports playoff games. The few studies that do include playoff games on their own find that playoffs are associated with decreased crime or no changes in crime (Copus & Laqueur, 2019; Kalist & Lee, 2016). Yet, there are no studies that examine the relationship between playoff hockey games and crime. Research on regular season National Hockey League (NHL) games suggests that the presence of home games leads to small but statistically significant increases in city-level crime (Kurland & Piza, 2018; Kurland, 2019; Block, 2021). But since playoff sports games in general appear to be associated with decreased crime, whereas regular season games are generally associated with increased crime, it is important to assess if crime during NHL playoff game days follows the same pattern found in past research.

Background

Past Research on Professional Sports and Crime

In general, past research assessing the relationship between sports and crime does find that professional sports games contribute to increased crime, by about 9% on average, although specific estimates differ (Bretzke & Cohn, 2013; Marie, 2016; Yu et al., 2016; Mares & Blackburn, 2019; Menaker et al., 2019). The majority of studies compare crime on home game days to crime on

non-game days. One such study found that assaults and cases of drunk and disorderly conduct are higher on football and rugby game days relative to non-game days within a mile around the stadium (Breetzke & Cohn, 2013). Another study examined crime counts on game days versus non-game days in Cleveland, Ohio for professional baseball and basketball and for minor league hockey (Menaker et al., 2019). The authors found that, within half a mile of the stadium, there are about double the number of violent crimes on game days as well as significantly more instances of people resisting arrest. A third study using this methodology compared crime on days when the St. Louis Cardinals, a Major League Baseball team played at home versus on days in which the team did not play (Mares & Blackburn, 2019). The authors found that property crimes, simple assaults, and disorder crimes are higher on game days, especially in the downtown area near the ballpark. Lastly, a small body of research uses this methodology to examine if domestic abuse and violence against women are related to professional sports game days. Ivandic et al. (2021); Kirby & Birdsall (2022) both find that counts of domestic abuse are higher on days when professional soccer games are played relative to non-game days. Further, the results of Trendl et al. (2021) indicate that counts of domestic abuse increase on days in which professional soccer teams win (but not lose or tie) tournament games in England.

Other studies on sports and crime use a different methodology and compare crime on home game days to crime on away game days. Like the studies which compare crime on home game days to crime on non-game days, these studies typically find that games at home result in increased crimes. For instance, Rees & Schnepel (2009) compared crime on home game days to away game days when 26 college football teams played and found that home games result in increased assaults and vandalism, and arrests for both disorderly conduct and alcohol-related offenses. Although college football is not a professional sport, attendance and city-wide economic revenue is on par or higher than those of some professional football, basketball, and hockey teams (Baade et al., 2008). Yu et al. (2016)'s study of hourly crime in Memphis found that when professional and college basketball teams played at home, relative to when they played away or did not play at all, there were about 20-30% more robberies in the city. Third, Marie (2016) found that property, but not violent crime, is higher on days in which a London-based professional soccer team plays at home relative to when it plays away.

Despite most sports-crime studies finding that crime increases because of games, some studies

find that crime is not affected by the presence of sporting events (Baumann et al., 2012; Piquero et al., 2021). More specifically, Baumann et al. (2012) found that professional baseball, basketball, hockey, and football games in the United States played at home do not contribute to changes in violent or property crime. Piquero et al. (2021) found that a popular race car championship, the Formula One Grand Prix, does not lead to changes in violent, property, or sex trafficking crimes in Austin, Texas.

Regarding hockey specifically, past research indicates that the presence of NHL home games is associated with increased crime (Kurland & Piza, 2018; Kurland, 2019; Block, 2021). Kurland & Piza (2018) found that robbery, theft, aggravated assault, car theft, and burglary all increase around the hockey stadium in Newark, New Jersey on NHL game days compared to non-game days. A similar study by Kurland (2019) found that robbery is increased in the vicinity of the hockey stadium by about 25% three hours after hockey games begin in Newark when the local NHL team plays. Most recently, Block (2021) found that, compared to during and after away games, counts of assaults and property crimes are about 10% and 7% higher, respectively, during and after home games in four large cities with NHL teams.

The majority of papers assessing the relationship between professional sports and crime are limited by data or research designs, restricting the generalizability and validity of their findings. One notable example is Baumann et al. (2012) which uses data from the Uniform Crime Reporting (UCR) Program to estimate the effect of the presence of a number of sports teams on crime in several cities. The authors use county-level and annual data to estimate these effects, meaning that any number of confounders affect the results.¹ By using data less precise than incident-level with the exact time of the crime, it is not possible to estimate the effect of sports games on crime, without relying on implausible assumptions. While the majority of sports-crime studies do use incident-level data, they primarily examine crime during the entire day that a game happens (Kalist & Lee, 2016; Marie, 2016; Mares & Blackburn, 2019; Pyun & Hall, 2019). This means that crimes that occur before - even many hours before - a game starts would be considered caused by the game. Finally, a number of studies have examined the effect of a single sport in a single city (Marie, 2016; Kurland & Piza, 2018; Mares & Blackburn, 2019; Pyun & Hall, 2019). While this is useful for that particular city's policy makers, it is generalizable only if the effect of that sport is similar in all cities. Research by Block (2021) suggests otherwise, finding that the effect

of National Hockey League games, in particular, can vary substantially across cities.

As noted earlier, the vast majority of sports-crime research either examines only regular season games or does not examine playoff games apart from regular season games. This is a major limitation in the current literature as playoff games both attract the greatest number of viewers and are responsible for the most high profile and destructive criminal events. For example, in 2011 after the Vancouver Canucks lost in the final round of the NHL playoffs, fans violently rioted in downtown Vancouver, damaging and overturning cars, vandalizing storefronts, and setting large fires in the streets (Sawyer, 2021). By the end of the riot, nine police officers and nearly 150 civilians had been injured, and almost 100 rioters had been arrested. Local police and government officials attributed the cause of the riot to the Canucks playoff loss and the rioters being under the influence of alcohol (Furlong & Keefe, 2011). More recently, Philadelphia Eagles fans rioted after their team's surprise victory in the Superbowl, leading to looting, property damage, and injuries (Lardieri, 2018). Riots have also occurred after World Series baseball games in 2016 (Blau, 2016) and 2014 (Rocha, 2014), National Basketball Association championship games in 1990 (McGraw, 1990), 1992 (Rosenfeld, 1997), and 2010 (Allen & Linthicum, 2010), and several times in Canada since the 1990s during hockey playoff games (Canadian Press, 2011).

Playoff Games Versus Regular Season Games

Playoff professional hockey games are different from regular season games in a variety of ways. First, the structure of playoffs is not the same as the structure of the regular season. During the regular season, all teams play 82 games - 41 at home and 41 away in another city; for playoffs, only the top 16 of the 32 teams in the NHL play, as determined by the final regular season standings. There are four rounds of playoffs and in order to move onto the next round, a team must win four out of a possible seven games.

Playoff games also occur in a far narrower time range than regular season games. Whereas regular season hockey games occur from October through April - a time of considerable weather and society changes such as winter holidays - playoff hockey games are concentrated in only three months, with the bulk of games played in a single month. In the data studied in the current paper, 51% of games were played in April, 39% were played in May, and only 9.5% were played in June. The relatively narrow time window during which playoff games are played can greatly

reduce seasonality effects that may impact results. While seasonality effects are not an issue in home versus away analyses, as where a team played is not determined by the weather that day, it can affect studies that compare game days to non-game days over a long period that extends beyond the season time.

The third major difference between regular season and playoff games is that playoff games attract far more viewers than regular season games. More precisely, from the 2011-2012 through the 2020-2021 season, regular season games had between 390,000 and 590,000 TV views on average (Karp, 2021) while playoff games averaged between 3 million and 5.8 million TV views (Statista, 2021). While the stadiums themselves can only hold so many people and attendance might not be significantly different than that for regular season games, some cities setup large projectors outside the stadium just for playoffs which attract thousands of people (Penguins, 2018). In addition, a greater number of people go to local bars and restaurants to watch playoff games compared to regular season games. This leaves a larger pool of potential targets and motivated offenders of crime. If the city does not provide increased security, then there will not be as many people acting as capable guardians to prevent crime.

There are a limited number of empirical studies that assess playoff sports games and crime. Most studies either do not mention including playoff or championship games or include them in the analyses with regular season games (Rees & Schnepel, 2009; Yu et al., 2016; Kurland & Piza, 2018; Mares & Blackburn, 2019). However, the studies that do assess crime on playoff game days find that crime patterns on these days differ from crime patterns that occur on days in which a regular season game is played. Kalist & Lee (2016) compared crime on days with professional football playoff games to crime on days with regular season games in eight cities. They found that playoff games are associated with a net decrease in crime rates and crime counts and that this decrease was driven by reduced larceny and car thefts. The same study found that regular season games are associated with increased crime, particularly larceny and car theft. However, this analysis is limited because there were just 13 total playoff games, and the authors compare home game days to both away game days and normal non-game days. Copus & Laqueur (2019) compared crime during playoff games to crime during comparable non-playoff game days for professional football, basketball, and baseball playoffs in Chicago. They found that crime during football playoff games decreases by about 25% which is about 60 total crimes. There are also reductions in violent and

property crimes (but not drug crimes) during basketball playoff games, but there is no significant difference in crime during baseball playoff games.

Current Study

Past research by [Rees & Schnepel \(2009\)](#), [Marie \(2016\)](#), [Yu et al. \(2016\)](#), and [Block \(2021\)](#), use away games as the comparison group when assessing the effect of home games on city-level crime. They do so under the reasonable assumption that home and away game days are similar except that on home game days far more people will watch the game, including attending in person. One limitation to this method, however, is that regular season games are scheduled far in advance, meaning that other events may be intentionally scheduled during away games as the home stadium will be empty. This means that the studies may be measuring the effect of a home game against the effect of a different event, rather than home games versus no home games. Playoff games largely sidestep this limitation as games are only partially scheduled in advance. As each round of playoffs consist of a best-out-of-seven series, it is never known in advance exactly how many games will be played. Therefore, with the exception of the first four games - which are always played - other events in the city cannot be scheduled specifically on away game days. Studying professional hockey playoff games, therefore, can both better measure the effect of sports on crime, and focuses on a sport which is closely related to a number of riots and other criminal disturbances ([Furlong & Keefe, 2011](#); [Canadian Press, 2011](#); [Sawyer, 2021](#)).

While several papers examine crime only in the areas around the stadium ([Breetzke & Cohn, 2013](#); [Kurland & Piza, 2018](#); [Mares & Blackburn, 2019](#)), likely because crime patterns vary based on characteristics of the physical environment ([Brantingham & Brantingham, 1993](#)), we chose to analyze crime at the city-level for two reasons. First, thousands of people regularly go to bars located throughout each city to watch the game on television meaning that a substantial share of people watching the game do so far away from the stadium. TV viewership of playoff games ranges from 3-5.8 million people ([Statista, 2021](#)), meaning that even if a substantial share of these viewers are not from the home team's city, viewership - and thus potential victims or offenders - for the home team is several orders of magnitude higher than stadium attendance. Second, people who go to the stadiums to attend games must also depart to go home. Many of these spectators will take public transportation after the game which might require them to travel to several different

subway or bus stations throughout the city where they could be involved in criminal behavior, either as a perpetrator or victim. By restricting our analyses to just areas close to the stadiums, we would not capture playoff hockey related crime that occurs around local establishments that air the games or anywhere else in the city.

This study also expands the precision of our estimates and the policy relevance of our findings by studying a large number of cities over a long time period. Evidence from [Block \(2021\)](#) found that the effect of professional hockey games on crime differed between the four cities studied. This suggests that a single city analysis - or even a small number of cities - is unlikely to measure the general effect of hockey games on crime. To the unfortunate detriment of the current body of knowledge on this topic, many studies do examine only a single or small number of cities in their analyses. To robustly assess the effect of professional sports games on crime, therefore, requires two factors: incident-level crime data that allows for examining only crime after the start of the game, and a wide and diverse set of cities to determine the overall effect of sports on crime.

In this paper we satisfy both of these requirements by analyzing the effect of playoff hockey games from 15 teams between 2013 and 2019.² We examine differences in assaults, disorder crimes, and property crimes in each city during and after home playoff games and away playoff games. By only limiting our analysis to crime that occurred during and after the games, we are better able to estimate the effect of hockey games on crime. We examine these three crime types for two reasons: 1) because they are consistent with what has been studied in similar past studies and 2) because we are limiting our analysis to just a part of each day, we need sufficient power to detect small effects and therefore, we must exclude crimes such as domestic violence or homicide which occur less frequently than crimes in our chosen crime categories. We find that when playoff games are played at home there is a significant increase in disorder and property crimes and a non-significant increase in assault, relative to when playoff games are played away.

Data

For this paper we use hockey data that has the date and time of each game, which teams played, and where each game was played for NHL playoff games. We use crime data that includes the type of crime and the date and time the crime occurred, for each crime reported to the police. We

include all United States teams which were in the playoffs at least one year from 2013 through 2019 and which had publicly available incident-level crime data. In total, we have game and crime data for 632 playoff games from 15 cities over a seven-year period. The teams and cities that we include are: Boston Bruins, Carolina Hurricanes (Raleigh), Chicago Blackhawks, Colorado Avalanche (Denver), Dallas Stars, Detroit Red Wings, Los Angeles Kings, Minnesota Wild (Saint Paul), Nashville Predators, Philadelphia Flyers, Pittsburgh Penguins, San Jose Sharks, St. Louis Blues, Vegas Golden Knights (Las Vegas), and Washington Capitals (Washington DC).

Hockey Data

We webscraped data on each hockey game from the website Hockey Reference, a site that contains information about hockey games and players.³ For each playoff game this site provides information on which teams played in the game, the date and start time of the game, which stadium the game was played at, and the attendance at that stadium. The game start time for this website shows all times as Eastern Standard Time times. We convert these times to the proper local time. We use the stadium where the game was played to determine if a game is home or away for each of our studied teams.

There were 787 playoff games from 2013 through 2019 and this paper examines 455 unique games. As some of the 15 teams included in this paper played each other during a game, there are 632 team-games that we analyze. The full list of teams and the number of games they played where we have sufficient crime data available to analyze is available in Appendix Table 1.

Crime Data

We collected crime data from every city in the United States that has an NHL team that played in the playoffs at least one year from 2013 through 2019 and that has incident-level crime data publicly available. This crime data must have the date and time of the incident to allow for determining if the crime happened on a game day and after the game started, and the type of crime to categorize it into one of the three studied crime categories. Crime data for Chicago, Detroit, Los Angeles, Nashville, and St. Louis come from [Ashby \(2018\)](#)'s Crime Open Database which collected and standardized public crime data from those cities. Data for the remaining ten

cities come directly from that city’s open data portal.⁴

New York City also has publicly available crime data and NHL teams. However, because NYC has two teams - the New York Rangers and the New York Islanders - there may be days where NYC experienced both a home and an away game. As this would prevent an analysis on how home game days differ from away game days, we do not use either team in this paper.

Consistent with the literature on sports and crime (Breetzke & Cohn, 2013; Kalist & Lee, 2016; Marie, 2016; Copus & Laqueur, 2019; Block, 2021), we limit crimes in the current study to those identified as assaults, disorder-related crimes, and property crimes. Assault crimes include both simple and aggravated assault as well as intimidation. Disorder is a relatively broad category that includes alcohol-related offenses such as public intoxication and DUI, vandalism offenses, loitering, disorderly conduct, and disturbing the peace. Property crimes include all theft and burglary offenses including motor vehicle theft. Robbery and fraud are not considered property crimes.

Data from these cities come from the city’s publicly available crime data, rather than a standardized data set such as FBI Uniform Crime Reporting (UCR) Program Data. Therefore, the crimes included in each category for each city differs slightly, depending on which crimes the city includes in the data and how they define and label each crime. As a control for these differences, we include a city fixed effect in each regression model.

Methods

In this study we examine the effect of NHL playoff games when games are played at home relative to when games are played away. We use negative binomial regression to estimate the effect of National Hockey League playoff games on city-level crime from 632 games played by 15 teams between 2013 and 2019. We aggregate crimes into three broad crime categories - assaults, disorder crimes, and property crimes.⁵ Following past research (Rees & Schnepel, 2009; Marie, 2016; Yu et al., 2016; Block, 2021), we restrict our data to only days when the teams had a game - either home or away - and use away games as a natural experiment to measure the effect of professional hockey games on crime. As on average conditions in each city are similar on game days but for whether the game is played at home or not, using away game days as a reference group allows

us to examine the effect of hockey on crime. We further restrict the data to only crimes that happened after the start of the game through the rest of the night (until 11:59PM local time in each respective team's home city).

One limitation to a simple home versus away game analysis is that home and away games can start at systematically different times. Consider, for example, a team on the west coast, such as the San Jose Sharks. Hockey games are generally played at night, with 7PM local time being the modal start time. When played at home there are about five hours until midnight if the game starts exactly at 7PM. If they play an away game at an east coast team's stadium, the game will still start at 7PM local time, which is 4PM San Jose time. This means that an away game against an east coast team gives three additional hours for crime to occur.⁶ Even if home games had zero effect on crime, we would still expect to see more crimes during home games than away games for west coast teams, and the opposite for east coast teams playing on the west coast, purely as an artifact of when games start. To control for this, we include a numeric variable with the hour of the day that the game started at, in effect adjusting for the number of hours left for crime to occur.

Our main variable of interest is whether the game is played at home or away. This variable is binary with home=1 and away=0. This allows us to interpret results as the effect of the game played at home relative to the game played away. For each of our analyses we include a number of control variables. First, we use city fixed effects to control for differences between each city, such as how they define crime types, general crime trends and environmental, social, or economic features in the city. We also control for the year and month the game is played as well as the day of the week. Finally, we control for whether the team of interest won that game and the number of people who attended the game in person at the home team's stadium.⁷ Each model uses robust standard errors. We also rerun each model using Poisson regression, which is another robust method for analyzing count data (Wooldridge, 2010). Results are very similar for both negative binomial and Poisson regression.

Results

Table 1 shows the mean and standard deviation for the number of crimes in each city from the start of the game until the end of that day for away and home games as well as averaged across all games. Column 2 shows the results for assault crimes, while columns 3 and 4 show results for disorder and property crimes, respectively. The fifth column shows the number of games played at away and home, which are 318 and 314, respectively. For each crime category there are more crimes, on average, during home games than during away games. There are on average 15.95 assaults from the time the game starts during away games until the end of the day, with a standard deviation of 20.55 assaults. During home games this is slightly higher with an average of 16.20 assaults and a standard deviation of 21.02. There is a larger difference with disorder crimes with 17.61 crimes during away games (SD = 23.04) and 20.75 (SD = 29.77) crimes during home games, an increase of 18%. Property crimes show a more modest increase during home games, with 27.51 property crimes reported during away game days (SD = 26.83) and 28.10 (SD = 27.63) during home games, a 2.1% increase. At face value this suggests that home game days are related to an increase in crime in their respective city.

Table 2 shows the results of the negative binomial regression assessing the effect of home games on crime. Row 1 shows the exponentiated regression coefficients which are the incident rate-ratios (IRR), the relative rates of change in the number of each crime category. This can be interpreted as the percent change in each crime when the game is played at home relative to when it is played away. Row 2 shows the robust standard error and row 3 shows the p-value. The fourth row shows the 95% confidence interval for the IRR. The final row shows the average number of crimes during away games for each crime category. This row has the same values as away games in Table 1 and is repeated here to allow for easy interpretation of the effect size.

Column 2, showing assault, is not significant with an IRR of 1.016 (95% CI [0.961, 1.075]) and a p-value of 0.570, far above the traditional 0.05 significance threshold. Disorder crime, shown in column 3, has an IRR of 1.073 (95% CI [1.011, 1.140]) and is statistically significant with a p-value of 0.021. This means that during home games cities experience about 7% more disorder crimes than during away games. Considering the base rate of about 18 disorder crimes in a city after a game starts during away games, this 7% increase is about 1.3 additional disorder crimes.

The final column shows results for property crime has an IRR of 1.042 (95% CI [1.016, 1.069]) and is statistically significant with a p-value of 0.001. This means that there is about a 4% increase during home games relative to away games, which is a difference of about 1.1 property crimes.

We also reran each model using Poisson regression instead of negative binomial. Results are shown in Appendix Table 2 and this table is formatted identically to Table 2. Results are very similar to those shown in Table 2.

As a demonstration of the importance of restricting crime to only those that occurred after the game began, we reran our negative binomial models using data that include crimes during that entire day. These results are shown in Appendix Table 3 and follow the same format as Table 2 and Appendix Table 2. Now, all of the crime categories are non-significant and the effect sizes for each are close to zero. The majority of crimes in a city occur before the game starts, due to most NHL games starting in the evening, so examining the entire day's crime introduces a great deal of noise into any analysis. As the most common game start time is 7PM, using the entire day of data is tantamount to using annual data to study a policy that began in the middle of September.

Discussion

Past research assessing the relationship between professional sports and crime generally finds that the presence of sports games, including professional hockey games, played in a given city is associated with increased crime ([Block, 2021](#); [Ivantic et al., 2021](#); [Breetzke & Cohn, 2013](#); [Kurland & Piza, 2018](#); [Kurland et al., 2018](#); [Mares & Blackburn, 2019](#); [Marie, 2016](#); [Yu et al., 2016](#)). However, only a few past studies have assessed if playoff games separately are associated with changes in crime and the results from these papers have yielded opposite findings to what has been found with regular season games such that crime is slightly decreased when there is a playoff game ([Copus & Laqueur, 2019](#); [Kalist & Lee, 2016](#)). These studies, which analyzed playoff football, basketball and baseball games conclude that football and basketball playoff games are associated with a decrease in crime, but baseball playoff games are not associated with changes in crime.

To the authors' knowledge, there have not been any studies assessing the effect of NHL playoff games on crime, so it is unclear if hockey playoff games follow this same pattern. In addition,

many past studies on the sports-crime relationship are limited as they only include a single city in their analysis (Breetzke & Cohn, 2013; Kurland & Piza, 2018; Mares & Blackburn, 2019; Yu et al., 2016), which limits the generalizability of the sports-crime relationship across all cities. Additionally, the majority of these studies include crime that occurs throughout the entire day and not just around game time (Breetzke & Cohn, 2013; Kalist & Lee, 2016; Rees & Schnepel, 2009; Pyun & Hall, 2019). By doing this, most of the crime incidents included in these studies are not related to the games at all, which introduces a great deal of noise to their analyses and limits their ability to detect how games affect crime. In response to these gaps and limitations, the current study examines changes in crime counts for assaults, disorder crimes, and property crimes during and after home and away NHL playoff games in 15 U.S. cities from 2013 to 2019 using only crimes that happened after the start of the game.

We find that, relative to during and after away playoff games, there are approximately 7% more disorder crimes and 4% more property crimes that occur during and after home playoff games. While these are modest increases in percent terms, this corresponds to just over one additional disorder and property crime in a city during the time after a game starts when played at home relative to when played away. We do not find any statistically significant differences in assaults. These results partially contrast both with prior findings of crime responses for NHL regular season games and for crime responses for playoff sports games for sports other than hockey. Whereas past research on hockey and crime for regular season games finds that assaults and property crimes increase during home game days (Block, 2021; Kurland, 2019; Kurland & Piza, 2018), we find that playoff games do not significantly affect assault but do increase property crimes. This suggests that NHL playoff games are associated with different changes in crime than regular season NHL games. Therefore, city responses to hockey games - such as deploying police around the stadium and popular sports bars, or limiting alcohol consumption during games - should differ between normal season and playoff games due to the differences in crime trends between the normal season and playoffs.

Additionally, while past research on playoff games and crime finds that the presence of football and basketball playoff games decreases crime (Copus & Laqueur, 2019; Kalist & Lee, 2016), we find that the crimes studied either increase or do not change significantly. This suggests that NHL playoff games are associated with different changes in crime compared to playoff games from other

types of sports. As a result of these contrasting findings, local officials should give special attention to reducing crime during NHL playoff games.

One possible reason that could explain why disorder and property crimes are higher during and after home playoff games relative to away playoff games is that alcohol consumption and intoxication may be higher during home games. There are naturally going to be more people in and around the hockey stadium when home games are played (as opposed to away games when the stadiums are closed or holding non-hockey events) so there may be more people that could cause disturbances or be cited by police officers for public drunkenness and related disorder offenses. The increase in the number of people may lead to more suitable victims for property crime offenders. In response to this finding, staff working in stadium concessions or in local bars should limit the number of alcoholic beverages purchased by any one spectator. Additionally, stadium security staff and those working security at local sports bars should ask visibly intoxicated and overly unruly fans to leave the premise in order to prevent them from getting more rambunctious and possibly getting cited for a disorder-related offense and committing - or falling victim to - property crimes.

While our results indicate that disorder and property crimes increase during and after NHL home playoff games relative to away games, there is no statistically significant effect for assault. One possible reason for this is because cities might deploy additional police officers and take additional security measures during home playoff games that deter people from committing more of these types of crimes. Given playoff games association with past violence, primarily in the form of riots, law enforcement may prioritize detecting and preventing violent crimes such as assault, which could explain the lack of an effect on assault crimes. Assault, unlike many disorder and property crimes - which may only include the offender if the offense is a crime such as public intoxication or DUI, or if the property crime is against a location, such as shoplifting, rather than stealing from an individual - also requires the presence of a suitable victim. If playoff games do not lead to a sufficient change in the balance of motivated offenders, suitable victims, and capable guardians, then it is reasonable that there will be no change in assaults. This may also affect property crimes if potential victims take additional precautions to prevent being victimized out of concern that playoff games will lead to more property crime. The precise mechanism for why disorder and property crimes increases while assault does not is an avenue for future research.

Though the methods and data used in the current study improve upon past research which, for

the most part, only include one city or include crimes that happened before the game, this paper still has some notable limitations. First, this paper looks at crime that occurred throughout entire cities, and did not limit crimes to those that occurred solely around the hockey stadiums. Several past studies that examine the relationship between sports and crime geographically restrict their analyses to areas close to where the games are played and find that crime on home game days increase significantly near the stadium (Breetzke & Cohn, 2013; Kurland & Piza, 2018; Mares & Blackburn, 2019). Additionally, research indicates that crime patterns in general are not evenly distributed across space, and depend highly on the characteristics of the physical environment (Brantingham & Brantingham, 1993). While we prefer our approach because it allows for a measure of game-related crime that does not occur in the immediate vicinity of the stadium, it does limit the policy relevance of this study. Police are the most common public safety response to crime - in particular for transient crime such as those crimes caused by major events - meaning that increased police presence would be a likely policy response to this study's findings. However, police are routinely deployed to areas in a city where the police believe crime to occur, rather than equally or randomly distributed across the city. Therefore, for more precise policy relevance, future studies should examine specific areas in the city - including around the stadium but also likely crime-attractor areas such as sports bars and public transportation stations - to see where and how crime changes during home games versus away games. We also note that our measured effect size is small in terms of the number of additional crimes, meaning that policy makers should carefully consider the cost of their response to ensure that it does not outweigh the benefit of abating only a single property and disorder crime.

Focusing only on crime near the team's stadium has another issue. During away games, there cannot be a hockey game in the team's stadium, but it may host other events. This means that comparing home and away game crime near the stadium may incorrectly measure home game crime against some other event's crime, rather than home game crime against normal crime around the stadium on a day without any events. These events can also include other sports games. For example, in Boston, the NHL hockey team shares a stadium with an NBA basketball team and the teams play home games on alternating days. At the city-level, this still affects analyses as some events may be scheduled intentionally during away games as that stadium is guaranteed to be unoccupied. However, this is a far larger issue for regular season games than for playoff games.

Only the top 16 teams - of the NHL's 32 teams - reach the playoffs in any year. Hockey standings can change drastically within a small number of games, meaning that who enters the playoffs is largely determined a few days before playoffs begin, limiting the ability of cities to plan events knowing that the stadium will be available. Even among the teams that reach playoffs, there is a great deal of uncertainty for how far they make it and how many games they play each round. Even when teams reach the playoff, they must advance through four rounds, further increasing the uncertainty for when the stadium may be available to host other events. Given this uncertainty, cities are unlikely to schedule many events - particularly large events that may take weeks or months of planning - during away playoff games.

The relatively broad categories of our three studied crimes - assault, disorder crimes, and property crimes - may also conceal important trends in particular types of crimes included within the categories. For example, assault includes a wide range of levels of severity from a slap in the face to a non-fatal gunshot wound. Future research should examine subcategories of the crimes presently studied, as well as include other theoretically relevant offenses, such as domestic abuse which has been shown to increase after professional soccer games (Kirby & Birdsall, 2022; Ivandic et al., 2021; Trendl et al., 2021). These studies would also shed light on the final limitation of this study, and one which is shared by most sports-crime studies: we measure whether crime changes, but not *why* it changes. While we are motivated by past research tying alcohol use to both sports games (Eastman & Land, 1997; Klick & MacDonald, 2021) and crime (Bromley & Nelson, 2002; Richardson & Budd, 2003; Parks & Fals-Stewart, 2004; Rothman et al., 2012; Hammerton et al., 2017; Leonard & Quigley, 2017; Chalfin et al., 2019), as well as changes in routine activities, the present study does not look specifically at what mechanisms lead to disorder and property crime increases during playoff games but not significant increases in assaults. As properly understanding the mechanism behind crime changes is key to designing effective crime control strategies, future research should prioritize studying the mechanisms behind sports-crime relationships.

Conclusion

This study found that during and after home playoff hockey games there are about 7% more disorder crimes, 4% more property crimes and a non-significant increase in assaults, relative to

during and after away hockey games. The methods used in this study are advantageous to the methods used in past sports-crime studies because they better allow us to estimate the general effect of sports, and in this case, NHL playoff games, on city-level crime. By including 15 cities in this paper as opposed to one or a few cities, and by including only crime that occurs after the start of the games in our analysis, instead of including crime that occurred throughout the entire day, we include only crimes that are most likely to be related to the games and use the most representative sample of cities available.

Given the public availability of incident-level crime data from nearly every major city in the United States - and the growing availability of FBI National Incident Based Reporting System (NIBRS) data which is detailed enough to carry out analyses done in most sports-crime research ([Kaplan, 2021a](#)) - there remains few reasons for future research to look at only a single city or even a few cities. Future research assessing the effect of professional sports playoff and regular season games on crime should examine a large number of cities over many years of data to best measure the relationship between sports and crime. By examining many cities and years of data, research can determine heterogeneous effects of sports and crime, such as differences between cities and over time.

As playoff games are associated with higher likelihoods of riots and other criminal events than regular season games, this topic remains an ample and important avenue for research. Future research should also examine what conditions affect the sports-crime relationship, following recent studies such as [Klick & MacDonald \(2021\)](#) which examined how alcohol use during baseball games affected crime. Future research should also consider how factors such as masculinity, hooliganism, social class, among others, might affect the relationship between sports games and crime. As the results of our study differ from the results of past studies measuring the effect of other types of professional sports on crime ([Copus & Laqueur, 2019](#); [Kalist & Lee, 2016](#)), we encourage future researchers to assess the unique demographics of sports fans to examine why results differ between sports. By understanding both the heterogeneity in effects, and the causes of this relationship, policy makers can better respond to sports games, making it safer for both fans and the broader community.

Notes

¹The authors of this study also state that UCR data “are available only annually and at the county level”, which is incorrect as UCR data are available at the month-agency level (Kaplan, 2021b).

²While data are available for 2020 and 2021, we limit this analysis to 2013-2019 to avoid any effect of Covid-19 on results.

³<https://www.hockey-reference.com>

⁴Boston: <https://data.boston.gov/dataset/crime-incident-reports-august-2015-to-date-source-new-system>, Dallas: <https://www.dallasopendata.com/dataset/Dallas-Crimes/pumt-d92b>, Denver: <https://www.denvergov.org/opendata/dataset/city-and-county-of-denver-crime>, Las Vegas <https://opendataportal-lasvegas.opendata.arcgis.com/datasets/metro-cfs-opendata/explore>, Philadelphia: <https://www.opendataphilly.org/dataset/crime-incident-reports>, Pittsburgh: <https://data.wprdc.org/dataset/uniform-crime-reporting-data>, Raleigh: <https://data-ral.opendata.arcgis.com/datasets/daily-raleigh-police-incidents/explore?location=35.786000%2C-78.643000%2C11.82&showTable=true>, Saint Paul: <https://information.stpaul.gov/Public-Safety/Crime-Incident-Report-Dataset/gppb-g9cg>, San Jose: <https://data.sanjoseca.gov/dataset/police-calls-for-service>, Washington DC <https://opendata.dc.gov/search?collection=Dataset&q=crime>

⁵Crime data for Washington DC is not detailed enough to determine if the crime was a disorder crime, so we exclude this city only from the disorder analysis.

⁶In the current data, the earliest San Jose Sharks home game begins at 12PM while the earliest away game begins at 4PM San Jose time. On average, home games start at 6:17PM while away games start at 6:45PM, meaning that home game days are slightly longer than away game days.

⁷Playoff hockey games cannot lead to a tie.

Table 1: Average and (standard deviation) for number of crimes of each type for home and away games

	Assault	Disorder	Property	# of Games
Away	15.95 (20.55)	17.61 (23.04)	27.51 (26.83)	318
Home	16.20 (21.02)	20.75 (29.77)	28.10 (27.63)	314
Total	16.07 (20.77)	19.16 (26.61)	27.80 (27.21)	632

Note: Only crimes that occurred after the start of the game are included. Crime data for Washington DC is not detailed enough to determine if the crime was a disorder crime, so we exclude this city only from the disorder analysis. Therefore, there were 280 away games and 275 home games in the disorder analysis, a total of 555 games.

Table 2: Negative binomial regression analyzing the effect of a home game compared to an away game

	Assault	Disorder	Property
IRR	1.016	1.073*	1.042**
Robust Standard Error	0.029	0.033	0.014
P-value	0.570	0.021	0.001
95% Confidence Interval	[0.961, 1.075]	[1.011, 1.140]	[1.016, 1.069]
Average # of Crimes	15.95	17.61	27.51

Note: These models use only crimes that happened after the start of the game. Each model includes controls for the round of playoff, the year, month, and weekday of the game, attendance at the home team’s stadium, the hour of the day the game started, whether the team of interest won, and a city fixed effect. Each model is clustered by the city. The average number of crimes is for away games only.

*p<0.05
 **p<0.01

Appendix Table 1: Teams included in this analysis

Team Name	City, State	Games Played
Boston Bruins	Boston, MA	42
Carolina Hurricanes	Raleigh, NC	14
Chicago Blackhawks	Chicago, IL	76
Colorado Avalanche	Denver, CO	18
Dallas Stars	Dallas, TX	6
Detroit Red Wings	Detroit, MI	31
Los Angeles Kings	Los Angeles, CA	53
Minnesota Wild	Saint Paul, MN	10
Nashville Predators	Nashville, TN	61
Philadelphia Flyers	Philadelphia, PA	19
Pittsburgh Penguins	Pittsburgh, PA	65
San Jose Sharks	San Jose, CA	78
St. Louis Blues	St. Louis, MO	75
Vegas Golden Knights	Las Vegas, CA	7
Washington Capitals	Washington DC	77

Appendix Table 2: Poisson regression analyzing the effect of a home game compared to an away game

	Assault	Disorder	Property
IRR	1.010	1.072**	1.040**
Robust Standard Error	0.022	0.016	0.012
P-value	0.649	0.000	0.001
95% Confidence Interval	[0.967, 1.055]	[1.040, 1.104]	[1.017, 1.063]
Average # of Crimes	15.95	17.61	27.51

Note: These models use only crimes that happened after the start of the game. Each model includes controls for the round of playoff, the year, month, and weekday of the game, attendance at the home team's stadium, the hour of the day the game started, whether the team of interest won, and a city fixed effect. Each model is clustered by the city. The average number of crimes is for away games only.

*p<0.05

**p<0.01

Appendix Table 3: Negative binomial regression analyzing the effect of a home game compared to an away game using crimes during the entire day of the game

	Assault	Disorder	Property
IRR	0.999	1.017	1.007
Robust Standard Error	0.014	0.018	0.016
P-value	0.962	0.349	0.665
95% Confidence Interval	[0.972, 1.028]	[0.982, 1.052]	[0.976, 1.039]
Average # of Crimes	58.75	59.12	98.57

Note: These models use every crime on the game of a game, even crimes that happened before the start of the game. Each model includes controls for the round of playoff, the year, month, and weekday of the game, attendance at the home team's stadium, the hour of the day the game started, whether the team of interest won, and a city fixed effect. Each model is clustered by the city. The average number of crimes row is for away games. The average number of crimes is for away games only.

*p<0.05

**p<0.01

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