

Professional Sports and Crime: Do Professional Hockey Games Increase City-Level Crime Rates?

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Abstract: Previous research has found that sports games increase certain crimes including theft and vandalism, but the relationship between sports and other offenses such as motor vehicle theft, robbery, and assaults is mixed. Using regular season National Hockey League (NHL) game data and city-level, incident-level crime data from four large U.S. cities, this paper estimates if professional ice hockey games played at home is associated with increases in property crimes, alcohol-related crimes, and assaults during and right after games the over course of four NHL seasons. Results show that NHL games lead to small but significant increases in property crimes and assaults. There is no significant effect for alcohol-related crimes. Implications and suggestions for future work are discussed.

Keywords: Sports, Crime, NHL, Routine Activities Theory

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Introduction

Professional sports play a major role in American culture and are accompanied by both economic and social benefits that impact a large number of people (Rosentraub, et al., 2008). In 2016, the National Football League (NFL) brought in \$13 billion, Major League Baseball (MLB) brought in \$9.5 billion, the National Basketball Association (NBA) accumulated \$4.8 billion, and the National Hockey League (NHL) rung in \$3.7 billion (Kutz, 2016). This money was distributed to the athletes, athletic trainers, and thousands of game day staff. In addition, these athletic contests serve as a form of entertainment, inspiration, and bonding for millions of people across the country. Forty-one United States cities have at least one professional sports franchise and during the 2018-2019 season, on average, 67,042 fans attended each NFL game, 28,794 attended each MLB game, 17,857 attended each NBA game, and 17,456 attended each NHL game, with many games selling out (Gough, 2019). This means that professional sports games are popular among the general public and therefore, have the potential to impact society in meaningful ways.

While professional sports provide communal benefits such as entertainment, opportunities to bond with family and friends, and additional job opportunities (Wann, 1995; Swindell and Rosentraub, 1998), a limited - but growing - area of research regarding professional sports is how they can breed societal consequences, specifically how sports games can increase city-level crime (Rees and Schnepel 2009; Breetzke and Cohn, 2013; Pyun and Hall, 2019; Kalist and Lee, 2016; Yu et al., 2016; Marie, 2016; Copus and Laqueur, 2019; Mares and Blackburn, 2019; Campaniello, 2013). One theoretical viewpoint that can help explain how sports games can affect crime is routine activities theory, proposed by Cohen and Felson in 1979 (Cohen and Felson, 1979). The theory posits that three factors must co-exist in a given place at the same time: a motivated offender, a suitable target, and the absence of a capable guardian – all of which can be affected by large sporting events.

Alcohol consumption is common for sports spectators who are watching a game, either at the stadium, in a bar, or at home (Centers, 2020; Eastman and Land, 1997). People who are intoxicated with alcohol have a higher chance of becoming offenders and victims (Greenfield and

Weisner, 1995; Carpenter and Dobkin, 2010). Indeed, there is a well-established link between alcohol intoxication and crime (Richardson and Budd, 2003; Deehan, 1999; Parrott and Eckhardt, 2018). Furthermore, research shows that alcohol consumption during sports games contributes to the perpetration of violent and criminal behavior (Ostrowsky, 2018; Klick and MacDonald, 2020). People who are under the influence of alcohol might also be more prone to becoming victims of crime at sports games because alcohol contributes to decreased awareness (Sayette, 2017). This could lead people to be less aware of potentially criminogenic surroundings and less prepared to protect themselves if they are approached by an offender. In other words, individuals under the influence of alcohol might have decreased guardianship over themselves.

Sports games might also contribute to increased crime from a routine activities perspective if law enforcement officers are being redirected to patrol the areas around the stadium from another area in a given city. If this occurs, then potential offenders in the areas that are no longer patrolled might be more confident in their ability to engage in criminal behavior and evade arrest. But on non-game days, when these areas are marked by police presence, these same potential offenders might recognize that they do not have the same opportunity to freely engage in illegal behaviors without getting arrested and therefore will choose to abstain from crime. This idea is supported in previous research which finds that increased law enforcement presence can help reduce crime (Owens, 2013; Chalfin and McCrary, 2017; Kaplan and Chalfin, 2019).

Regarding past research on the relationship between professional sports and city-level crime, results have been inconsistent overall. Whereas some types of offenses have yielded consistent results, other have not. For example, theft, vandalism, and disorderly conduct have been repeatedly shown to increase significantly on days in which professional baseball (Mares and Blackburn, 2019), professional soccer (Marie, 2016), and both professional (Pyun and Hall, 2019; Kalist and Lee, 2016) and Division 1 college football (Rees and Schnepel, 2009) are played.¹ Burglary also produces consistent findings, but unlike the offenses mentioned above, sports games do not seem to affect burglary (Mares and Blackburn, 2019; Breetzke and Cohn, 2013). However, for other offenses including motor vehicle theft, robbery, assaults, and alcohol-related offenses, the results are not as conclusive. Although some studies find that some or all of

these crimes are significantly higher on professional hockey (Kurland and Piza, 2018) soccer (Marie, 2016), professional (Kalist and Lee, 2016; Miller et al., 2013) and college football (Rees and Schnepel, 2009) and professional and college basketball (Yu et al., 2016) game days at a city-level, others find null effects (Pyun and Hall 2019; Breetzke and Cohn, 2013). Regarding assault, Mares and Blackburn (2019) found that simple assaults are significantly higher on days in which the St. Louis Cardinals, a professional baseball team, play but aggravated assaults do not change. With regard to a more non-traditional sporting event, Piquero et al (2019) observed no changes in violent, property, or sex trafficking–related crimes as a result of the Formula 1 Grand Prix racing weekend. Interestingly, one study done by Copus and Laqueur (2019) found that televised professional football, basketball, and baseball playoff games led to significant decreases in total city-level crime including violent, property, and drug crimes with no evidence of crime displacement in Chicago.

Two other studies also assessed the relationship between sports and crime. The first by Baumann et al. (2012) found that professional sports do not contribute to changes in crime at all while the other by Campaniello (2013) found that hosting the 1990 World Cup led to increases in pick-pocketing, burglary, shoplifting, and intentional personal injuries but did not affect theft from a car or car theft. However, these studies utilized monthly and yearly data, respectively, which makes it impossible to sufficiently assess daily crime patterns. Given that sports games are highly unlikely to affect crime past a short time frame after the event, most likely that night or the following day, Baumann et al. (2012) and Campaniello (2013) are unable to accurately measure the effect of the game on local crime. As cities can experience multiple sporting events, of multiple sports types and both home and away games, in a single month, and much more in a year, having data that is only precise to the month and year is far too restrictive to study this topic properly.

One notable gap in the evidence regarding the relationship between sports and crime is that time of day is not accounted for. To this author’s knowledge, only three studies to date that examine the relationship between sports and crime have broken down game day crime into specific hours in order to isolate crime that occurs during the games (Yu et al., 2016; Marie,

2016; Copus and Laqueur, 2019). The remaining studies look at the entire day or the day past an arbitrary threshold that includes crimes that occur before the game began. For example, Rees and Schnepel (2009), Breetzke and Cohn (2013), and Pyun and Hall (2019) look at all crimes that occur on football game days while Kalist and Lee (2016) used time-start fixed effects to control for when the game started but still include all crime throughout the day. In order to have a more accurate analysis that looks at whether sports have an effect on crime, crimes need to be limited to the time of the day in which the games occur. Otherwise, the findings will largely include crimes that are not game-related.

Current Study

The current paper addresses these limitations by measuring if the presence of professional ice hockey and more specifically, NHL games, played at home in four large cities in the U.S. is associated with increases in crime during and after games over the course of four NHL seasons. The number of crimes that occur during and following home games are compared to the number of crimes that occur during and following away games. By assessing only crimes that occur during and after the game is played, this paper can better estimate how crime changes as a result of a professional sports game that is played on a given day. The majority of previous research has concentrated on other sports such as football, soccer, and baseball and has largely ignored hockey, which is why this study assesses NHL games. To this author's knowledge, only one other study examined the relationship between hockey and crime specifically (Kurland and Piza, 2018), and it only assessed a single type of offense in one city. The current study - which includes many types of offenses in four cities - hypothesizes that crime counts will be significantly higher when teams play at home compared to when they play away in another city.

Methods

This study assesses the effect of NHL games on crime by examining how crime changes in a team's home city when games are played at home versus away from home. The current analysis measures differences in crime counts during home and away games from the time the

game starts until 11:59pm in each team's respective time zone that day from the 2015-2016 season through the 2018-2019 season across all cities included in this paper, and for each city, controlling for the day of the week, the month, and the year.² It does so using a Poisson regression using the following form:

$$\log E(Y) = \beta_0 + \beta_1 \text{home} + \lambda_{\text{city}} + \alpha_{\text{dayOfWeek}} + \zeta_{\text{year}} + \omega_{\text{month}} \quad (1)$$

where Y is the number of crimes that occur each night for each crime category in each city. $\beta_1 \text{home}$ is a binary variable for whether the game was played at home (home = 1, away = 0). λ_{city} is the city fixed effect that controls for differences that exist between cities and is used only for the regression models that include all cities assessed in this study.³ $\alpha_{\text{dayOfWeek}}$ is the day-of-week fixed effect to control for differences in crime that occur on different days of the week. ζ_{year} and ω_{month} are the year and month fixed effects, respectively, that control for differences in crime that exist across time such as seasonal trends.

One concern with comparing home and away games is that a portion of the away games for each team occur at systematically different times than home games. For example, consider a team from the East Coast that plays a team from the West Coast. When played at home, the game would begin, as the majority of nighttime games do, at 7 pm or 8 pm local time. When played away, at the West Coast stadium, the game would start at 10 pm or 11 pm local time. This would mean that the analysis compares crime starting at 7 pm to those starting at 10 pm. If away games are systematically at different times of the day than home games are, then the results of an analysis using all games would be inaccurate. To address this concern, this paper reruns Equation (1) on a subset of games that excludes all away games where the time zone of the away city is different than the time zone of the city of interest.

Data

This paper uses data on professional hockey game dates, times, and locations, and local incident-level crime data for the four most populated cities with both NHL teams and publicly available incident-level crime data: Boston, Chicago, Los Angeles, and Philadelphia.⁴

NHL Game Data

Game data is taken for the teams affiliated with the four cities included for all regular season games that occurred over the course of four seasons, 2015-2016, 2016-2017, 2017-2018, and 2018-2019.⁵ This data includes the date and start time of each game, where the game was played (home or away), and who the opponent was. Every season, each team plays a total of 82 games, 41 of which are at the team's home arena and 41 of which are played in an away city. There are a total of 1,310 games included in the first analysis of this study which includes all games.⁶ All of the games started between 9:00 am and 10:30 pm local time, with the median start time occurring at 7:00 pm.⁷

There are a total of 945 games included in the analysis that include only away games in the same time zone of the team of interest. Of these 945 games, 195 were played by Los Angeles, 210 were played by Chicago, and 270 were played by both Boston and Philadelphia. All of these games started between 11:30 am and 7:30 pm local time with the median start time being 7:00 pm local time.

Crime Data

Crime data for this paper comes from publicly available data released by each of the four cities.⁸ These records contain incidents on all types of crimes from before the start of the 2015-2016 NHL season to the end of the 2018-2019 season. For each incident, there is corresponding information detailing the type of crime that occurred and the date and time in which the crime took place. Consistent with the prior literature on this topic (Copus and Laqueur 2019; Rees and

Schnepel 2009; Marie 2016; Breetzke and Cohn 2013), only incidents identified as property crimes, alcohol-related crimes, and assaults are analyzed in this paper. More specifically, property crimes include motor vehicle theft, theft, larceny, vandalism, pick-pocketing, theft from a vehicle, and criminal damage. Alcohol-related crimes include operating under the influence of alcohol, disorderly conduct, liquor law violations, drinking in public, disturbing the peace, public indecency, and public drunkenness. Assaults include both aggravated and simple assaults. This study limits crime incidents for each city to only days in which the teams have games, both home and away games. Given the focus of this study, only crimes that occurred between the start of the game and the end of the day (11:59 pm local time) are included in the analyses.

Table 1 shows the mean (standard deviation) number of crimes per night during home and away games from the start of the game until the end of the night (11:59 pm) in each city (rows one through eight) and across all cities (rows nine and ten). Columns one and two describe the city of interest and whether the game was played at home or in another city's stadium, respectively. Columns three through five show how many offenses occur each night on average for the three crime categories: property crimes, alcohol-related crimes, and assaults.

Table 1 shows that a greater number of property crimes and a smaller number of alcohol-related crimes and assaults occur during away games compared to home games in Boston. In Chicago, there are more property and alcohol-related crimes that occur during away games compared to during home games. However, assaults occur more often during home games than during away games. In Los Angeles, there is a greater number of crimes for all the categories during away games than during home games. Conversely, in Philadelphia, there are fewer crimes for all the categories during away games than there are during home games. The standard deviations are relatively high for each city and crime category which means that there is high variability in the number of crimes that occur during and after each city's NHL team plays.

Table 2 is similar to Table 1 but depicts the mean number of crimes as well as the associated standard deviations for games included in the analysis using all home games and only away games in the same time zone as the local team. Compared to Table 1, crime trends in Boston and Chicago remained the same. However, in Los Angeles, crime trends for each category flipped in the opposite direction from Table 1. Property crime counts, alcohol-related

crime counts, and assaults were all greater in number during and after away games in Table 1 for Los Angeles but in Table 2, they were greater in number during and after home games. With regard to Philadelphia, trends in property crime and assault remained the same in Tables 1 and 2 but alcohol-related crime counts flipped. In Table 1, alcohol-related crime counts are higher during and after home games but in Table 2, they are higher during and after away games.

Results

Table 3 presents the results from the primary analysis that includes all games. The first column corresponds to the city, with all cities being in row one, Boston in row two, Chicago in row three, Los Angeles in row four, and Philadelphia in row five. Column two shows the incident rate ratio - the percent change in crime for home games compared to away games. This column shows how NHL games affect crime. The 95% confidence intervals are listed in column three. For context on how large these effects are, the average number of crimes per city per day for home and away games are listed in column four. There are three panels in Table 3 which show results for each of the three crime categories included in this paper. Results for property crimes are shown in Panel 1, results for alcohol-related crimes are shown in Panel 2, and results for assaults are shown in Panel 3.

Table 3 shows that, for the results which include all cities, the number of city-wide crimes that occur during and after home games is significantly different than the number of crimes that occur during and after away games for each of the crime categories ($p < 0.001$). Panel 1 shows that, on average, there is an 7.4% increase (95% confidence interval [5.2%, 9.6%]) in property crimes, which corresponds to about 2.12 additional incidents of property crimes that occur during home games from the start of the game until the end of the night (11:59 pm) relative to away games. These results are driven by significant increases in property crimes in Boston (IRR 1.492, 95% confidence interval [37.6%, 61.7%]) and Philadelphia (IRR 1.536, 95% confidence interval [47.3%, 60.2%]). However, in Chicago (IRR 0.906, 95% confidence interval [-12.0%, -6.7%]) and Los Angeles (IRR 0.764, 95% confidence interval [-29.3%, -17.3%]), there are significantly fewer property crimes that occur on home game days than on away game days.

Panel 2 shows that overall, for all cities, there is an 8.7% decrease (95% confidence interval [-12.9%, -4.4%]) in alcohol-related crimes on home game days compared to away game days meaning that there are 0.57 fewer alcohol-related crimes that occur during home game days from the start of the game to the end of the day (11:59 pm). This result is driven by significant decreases in alcohol-related crimes in Los Angeles (IRR 0.855, 95% confidence interval [-19.2%, -9.5%]), with the results for all other cities besides Philadelphia being non-significant. In Philadelphia, there are increases in alcohol-related crimes during and after home games relative to away games (IRR 1.161, 95% confidence interval [3.8%, 29.9%]). Panel 3 shows that there is a 9.7% increase (95% confidence interval [6.4%, 13.2%]) in assaults on home game days compared to away game days for all cities. This means that there are about 1.15 additional assaults that occur during home game days from the start of the game to the end of the day (11:59 pm). Exploring these results by city, there were significant increases in assaults on home game days relative to away game days in Boston (IRR 1.246, 95% confidence interval [12.2%, 38.3%]) and Philadelphia (IRR 1.403, 95% confidence interval [13.2%, 48.1%]). There were significant decreases in assaults in Los Angeles (IRR 0.838, 95% confidence interval [-21.3%, -10.9%]) during and after home games. There were no significant changes in assaults in Chicago for this first analysis.

Table 4 presents the results for the analysis in which away games only include those played in the same time zone as the city of interest. This Table is structured identically to Table 3. Similar to previous results, there are significantly more city-wide property crimes and assaults during home game days than away game days for all cities ($p < 0.001$). However, the effect is larger than the previous analysis: with there being an average of 9.6% (95% confidence interval [6.6%, 12.6%]) more property crimes and 18% (95% confidence interval [13.4%, 23.3%]) more assaults during and after home games than away games. This means that there are about 2.55 additional property crimes that occur during home games and 2.06 additional assaults. Broken down by city, the results for property crimes are driven by increases in Boston (IRR 1.347, 95% confidence interval [23.1%, 47.5%]) and Philadelphia (IRR 1.316, 95% confidence interval [25.6%, 37.3%]). There was a decrease in property crimes in Chicago (IRR 0.834, 95% confidence interval [-20.2%, -13%]), with no significant effects for Los Angeles. For alcohol-

related crimes, however, results show a non-significant effect contrasting with the results from the first analysis. This is true for the results which include all cities and for each individual city.

While the results for the regressions that include all cities are consistent for both analyses for property crimes and assaults, the same is not true for the results concerning each individual city. In Boston, Chicago, and Philadelphia, there was an increase in property crimes and assaults during and after home games than during and after away games for both analyses. However, this pattern was not true for Los Angeles. In Los Angeles, there was a decrease in property crimes during and after home games for the first analysis but this result was not significant for the second analysis. Regarding assaults in Los Angeles, there was a decrease in assaults during and after home games for the first analysis but for the second analysis, there was an increase in assaults on home game days compared to away game days.

In terms of alcohol-related crimes, the results for the regressions that include all cities show a decrease in alcohol-related crimes during and after home games for the first analysis but no significant difference for the second analysis. In Boston and Chicago, there were no differences in alcohol-related crimes during and after home games compared to during and after away games for both analyses. In Los Angeles, the results for alcohol-related crimes were similar to the results for all cities such that there was a decrease in alcohol-related crimes during and after home games for the first analysis but no significant difference for the second analysis. In Philadelphia, there was an increase in alcohol-related crimes during and after home games for the first analysis but no significant difference for the second analysis.

Discussion and Limitations

Prior research that focuses on the relationship between professional sports and crime has largely yielded inconsistent findings (Marie 2016; Kalist and Lee 2016; Miller et al. 2013; Rees and Schnepel 2009; Yu et al. 2016; Pyun and Hall 2019; Breetzke and Cohn 2013; Copus and Laqueur 2019; Mares and Blackburn 2019; Piquero et al., 2021). The majority of these studies are also limited as they include all crimes that occur over the course of the game day, even those that occur hours before the game begins. While a few studies have broken down game

day crime into specific hours in order to isolate crime that occurs during the games, hockey games have been largely ignored in the analyses (Yu et al. 2016; Marie 2016; Copus and Laqueur 2019). In response to these gaps, this paper looks specifically at crimes that occur during and after home and away NHL games in four large U.S. cities over the course of four hockey seasons. The first analysis compared crime during all home and all away games. In order to account for differences in home and away game start times when the away team is in a different time zone, this paper also examined the relationship between games and crime only for games where both teams were in the same time zone. By looking at crimes that occur during the games and for the rest of the night, rather than all day, it is possible to evaluate game-related crime and exclude many – though certainly not all - crimes not related to the games.

This study hypothesized that crime counts would be significantly higher on home game days than on away game days. This hypothesis was supported for property crimes and assaults in both analyses for the model that includes all cities. The first analysis, which included all away games, found that there are 7.4% more property crimes and 9.7% more assaults during and after home games than during and after away games. The results for both of these crime categories were driven by increases in property crimes and assaults in Boston and Philadelphia. The second analysis, which only included home games and away games for games where both teams are in the same time zone, found that there are 9.6% more property crimes and 18.3% more assaults during and after home games than away games across all cities. This result for property crimes were again, driven by increases in property crimes in Boston and Philadelphia and the result for assault was attributed to increased assaults in Boston, Philadelphia, and Los Angeles.

Regarding alcohol-related offenses, the first analysis shows that the number of crimes occurring on home game days are significantly declined (-9.1%) relative to the number of alcohol-related offenses occurring on away game days. The only individual city that showed this same result was Los Angeles, which experienced a 14.5% decrease in alcohol-related crimes on home game days relative to away game days. Results from the second analysis found no significant effect for alcohol-related crimes overall or for any individual city. Although the significant increases in property crimes and assaults are relatively large in percent terms in the regressions that include all four cities, the additional number of incidents that occur during and

after home games compared to during and after away games amounts to fewer than three for each crime category due to low base rates of crimes.

There are a few reasons that could help explain why crime counts are higher, on average, when NHL teams play at home compared to when they play away in another city. One reason is that people might consume more alcohol during these games. Indeed, previous research has found that sports fans drink alcohol at higher rates than do non-fans (Nelson and Wechsler 2003), and fans drink more on home game days than they do in other social settings (Glassman et al. 2007). Alcohol is linked to aggression, reductions in self-awareness, and crime (Sayette 2017; Richardson and Budd 2003; Deehan 1999; Parrott and Eckhardt 2018). Although this study did not find that home games are associated with an increase in alcohol-related crimes, except in Philadelphia for the first analysis, the effects of alcohol consumption could have led to the perpetration or victimization of property crimes or assaults which did show significant increases when home games are played. Another reason why there are higher crime counts during and after home games could be because NHL games attract large crowds which results in a larger pool of potential offenders and suitable targets of crime (Gough 2019). These targets can be both people and property. Kurland and Piza (2018) found that auto thefts are higher in the area surrounding the arena when the New Jersey Devils of the NHL play at home compared to when they do not play. While the current paper does not assess why crime counts are higher during and after home games, future research should aim to test these hypotheses in order to better understand the sports-crime relationship.

One important factor to consider with regard to the results is the characteristics of each of the four cities. For example, the results of this paper indicate that NHL games played at home increase crime counts more in Boston and Philadelphia than they do in Chicago and Los Angeles. Boston and Philadelphia are the two smallest cities, population wise, in this study which means that NHL games, which in all cities seat about 21,000 people in the stadium, could influence and reach a higher percentage of city residents which might reflect the observed changes in crime.

Another contextual factor that is important to mention is where the arenas are located in each city and what the environment around the arenas looks like. In Boston and Los Angeles, the

arenas are located downtown and are surrounded by bars, restaurants, and stores. One difference between these two arena locations, however, is that in Boston there are multiple forms of public transportation that go directly to the arena but in Los Angeles, the arena is located a few blocks from the metro and bus line stops (“Transportation”, 2020; “General Information”, 2020). In Chicago, the hockey arena is located west of downtown but is still surrounded by various local establishments including bars and restaurants. One interesting aspect of Chicago is that there is a bus available to the public that takes fans to the rink specifically on game days (“Directions & Parking”, 2020). On non-game days, the public transportation options are more limited. In Philadelphia, the hockey arena is located south of downtown and is surrounded by the city’s other professional sports venues, but not many independent bars and restaurants. Similar to Boston, there is regular public transportation to and from the arena. Although not tested in this paper, these contextual factors are important to consider and could affect how crime changes or does not change in response to NHL games from city to city.

While the methods used in this study improve upon the methods used in previous studies which largely do not look at hourly crime, the current analyses have several limitations. One such limitation is that this paper only analyzed crime in four cities that were not randomly selected. The relationship between NHL games and crime might be different in other, less populated cities where hockey games have different levels of support. Furthermore, in the second analysis, where away games outside of the team of interest’s time zone are eliminated, these games are restricted to conference and divisional games. These games may be different than other games because they affect the chances of securing a play-off spot for the championships which could affect fan behavior such as alcohol use as fans might be more concerned about the game.

This study found that NHL regular season home games in four heavily populated U.S. cities cause more property crimes and assaults and could result in fewer alcohol-related crimes compared to away games but it cannot conclude anything about where in the city these differences occur or if these results remain the same during playoff games or across different crime categories. Thus, future research should focus on where, specifically, crimes occur on game days - likely around the hockey stadium. If crimes are primarily occurring in this area during home game days, then cities can enhance security procedures in order to work to reduce

crime. Future research should also study playoff games well as lower-level sports such as high school athletics and large non-athletic events to determine if property crimes and assaults increase with the presence of functions that are not limited to NHL regular season contests. Lastly, other types of crimes, including violent crimes that are not assaults, should be assessed to expand on this paper and better understand the totality of the effect of professional hockey games on crime.

Even though this study found that NHL games lead to significant increases in property crimes and assaults and found mixed evidence as to the effect on alcohol-related crimes across all four cities in a general sense, the effect sizes are small in real terms given the low base rates of crime. Given these small effect sizes and the fact that not all of the cities explored in this paper, mainly Chicago and Los Angeles, experienced increases in crime counts on home game days, it would be irresponsible to recommend the implementation of expensive policies and preventative measures based on this study alone. However, there are a few options that exist to help reduce the small increase in crime when professional hockey games are played. First, city governments should make extra efforts to prompt their citizens to take precautions on home game days such as by encouraging them to not travel outside alone but rather with responsible companions, and to keep their belongings locked and out of sight. Prior research has found that securing (i.e., locking) cars results in fewer motor vehicle thefts (Farrell et al., 2011; Farrell, Tseloni, and Tilley, 2011). Second, cities could install additional and brighter lights in arena parking lots and near public transportation stops. Improved outdoor lighting has been shown to contribute to reductions in nighttime crime (Chalfin et al., 2021). Taking these precautions may help decrease the additional crimes that occur when home hockey games are played because people and property will be safer and less likely to be victimized.

Notes

¹Football refers to American football while soccer refers to European football. Over 41,000 fans attended NCAA Division 1 Collegiate football games, on average in 2019, making them as popular as professional sports games (NCAA 2020)

²Days in which games are not played were not chosen as the comparison group because there is no clear time to start the analysis as NHL games start at different times of the day.

³Because cities classify and report crime differently, controlling for city fixed effects takes these differences into account.

⁴New York City is not included because it has two NHL teams which would make the analysis difficult. Furthermore, incident-level crime data from San Jose, Columbus, and Washington D.C data are not available to the general public. Dallas also has more residents than Boston but due to extensive data issues it is not included in this study.

⁵Game information was webscraped from two hockey websites: hockey-reference.com and NHL.com. Regular season games do not include pre-season exhibition games or championship games.

⁶Chicago, Los Angeles, and Philadelphia all have a total of 328 games and Boston has 326 games.

⁷Game times are listed as the time they started in the time zone associated with the team of interest, not the time zone they occurred in. For example, of the Bruins played in San Jose at 7:00 pm pacific time, the start time is listed here as 10:00 pm eastern time because that is the city this study is analyzing in terms of crime count.

⁸The URL to the Los Angeles dataset used in this paper comes from <https://data.lacity.org/A-SafeCity/Crime-Data-from-2010-to-2019/63jg-8b9z>. The URL to the Chicago dataset used in this paper comes from <https://data.cityofchicago.org/Public-Safety/Crimes-2001-to-present/ijzp-q8t2>. The URL to the Philadelphia dataset used in this paper comes from <https://www.opendataphilly.org/dataset/crimeincidents>. The URL to the Boston dataset used in this paper comes from <https://data.boston.gov/dataset/crimeincident-reports-august-2015-to-date-source-new-system>.

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Table 1: Average (Standard Deviation) Number of Crimes per City per Night During Home and Away Games - All Games

City	Game Location	Property Crimes	Alcohol-Related Crimes	Assaults
Boston	Away	6.83 (4.56)	0.63 (0.85)	4.31 (2.98)
Boston	Home	9.99 (6.37)	0.59 (0.85)	5.5 (3.7)
Chicago	Away	71.36 (33.2)	1.48 (1.57)	11.32 (6.03)
Chicago	Home	68.53 (23.91)	1.27 (1.16)	12 (5.97)
Los Angeles	Away	10.74 (4.4)	18.88 (12.16)	16.21 (6.55)
Los Angeles	Home	8.25 (5.23)	18.04 (14.25)	13.96 (6.4)
Philadelphia	Away	25.57 (17.78)	3.98 (3.24)	15.49 (9.28)
Philadelphia	Home	36.8 (20.96)	4.46 (3.09)	21.14 (10.46)
Total	Away	28.69 (31.98)	6.26 (9.76)	11.85 (8.11)
Total	Home	30.89 (29.49)	6.09 (10.16)	13.15 (8.99)

Table 2: Average (Standard Deviation) Number of Crimes per City per Night During Home and Away Games For Games Where Both Teams are in the Same Time Zone

City	Game Location	Property Crimes	Alcohol-Related Crimes	Assaults
Boston	Away	7.44 (4.18)	0.66 (0.84)	4.51 (2.92)
Boston	Home	9.99 (6.37)	0.59 (0.85)	5.5 (3.7)
Chicago	Away	72.96 (20.02)	1.33 (1.25)	11.28 (4.28)
Chicago	Home	68.53 (23.91)	1.27 (1.16)	12 (5.97)
Los Angeles	Away	7.77 (3.4)	15.45 (10.3)	12.23 (4.54)
Los Angeles	Home	8.25 (5.23)	18.04 (14.25)	13.96 (6.4)
Philadelphia	Away	31.17 (18.17)	4.52 (3.19)	18.19 (9.21)
Philadelphia	Home	36.8 (20.96)	4.46 (3.09)	21.14 (10.46)
Total	Away	26.61 (26.73)	3.77 (5.89)	11.43 (8.58)
Total	Home	30.89 (29.49)	6.09 (10.16)	13.15 (8.99)

Table 3: Change in Crime on Home Game Days Compared to Away Game Days for Regressions with All Games

City	IRR	95% Confidence Interval	Average Number of Crimes
Panel 1: Property Crimes			
All	1.074***	[5.2%, 9.6%]	29.79
Boston	1.492***	[37.6%, 61.7%]	8.41
Chicago	0.906***	[-12.0%, -6.7%]	69.95
Los Angeles	0.764***	[-29.3%, -17.3%]	9.50
Philadelphia	1.536***	[47.3%, 60.2%]	31.19
Panel 2: Alcohol-Related Crimes			
All	0.913***	[-12.9%, -4.4%]	6.18
Boston	0.875	[-34.9%, 17.6%]	0.61
Chicago	0.868	[-29.6%, 7.0%]	1.38
Los Angeles	0.855***	[-19.2%, -9.5%]	18.46
Philadelphia	1.161**	[3.8%, 29.9%]	4.22
Panel 3: Assaults			
All	1.097***	[6.4%, 13.2%]	12.5
Boston	1.246***	[12.2%, 38.3%]	4.91
Chicago	0.971	[-9.6%, 4.4%]	11.66
Los Angeles	0.838***	[-21.3%, -10.9%]	15.1
Philadelphia	1.403***	[13.2%, 41.8%]	18.32

Note:

*p<.05,

**p<.01,

***p<.001

Table 4: Change in Crime on Home Game Days Compared to Away Game Days for Regressions with Subsetted Away Games

City	IRR	95% Confidence Interval	Average Number of Crimes
Panel 1: Property Crimes			
All	1.096***	[6.6%, 9.9%]	28.75
Boston	1.347***	[23.1%, 47.5%]	8.72
Chicago	0.834***	[-20.2%, -13%]	70.75
Los Angeles	1.029	[-11.5%, 19.7%]	8.01
Philadelphia	1.316***	[25.6%, 37.7%]	33.99
Panel 2: Alcohol-Related Crimes			
All	1.020	[-5.3%, 9.9%]	4.93
Boston	0.771	[-44.6%, 7.3%]	0.63
Chicago	0.963	[-30.2%, 32.8%]	1.30
Los Angeles	0.985	[-11.8%, 10.0%]	16.75
Philadelphia	1.064	[-6.0%, 20.6%]	4.54
Panel 3: Assaults			
All	1.183***	[13.4%, 23.3%]	12.29
Boston	1.155*	[2.6%, 23.0%]	5.01
Chicago	0.916	[-17.9%, 2.1%]	11.64
Los Angeles	1.13*	[0.02%, 27.4%]	13.1
Philadelphia	1.237***	[16.5%, 31.3%]	19.67

Note:

* $p < .05$,

** $p < .01$,

*** $p < .001$