



OJJDP

Serving Children, Families, and Communities

# JUVENILE JUSTICE BULLETIN

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## From the Administrator

Identifying the locations and conditions under which juveniles commit crimes can help law enforcement develop prevention strategies. Crime tends to cluster in hot spots where motivated offenders find available targets and a lack of supervision. The Office of Juvenile Justice and Delinquency Prevention (OJJDP) is committed to helping law enforcement direct resources to these hot spots.

This bulletin describes an OJJDP-funded study that was the first to identify where juveniles commit crimes and how these places differ from hot spots of adult crime. Over a 14-year period from 1989 to 2002, researchers mapped all crime incidents in Seattle in which a juvenile between ages 8 and 17 was arrested. They located juvenile crime hot spots, determined juvenile crime trends, and identified risk factors for juvenile crime.

The findings support collaboration between law enforcement and the community to target areas where juveniles congregate. It is my hope that these data will help law enforcement and others allocate resources and develop strategies to reduce juvenile crime.

Jeff Slowikowski  
Acting Administrator

## Hot Spots of Juvenile Crime: Findings From Seattle

David L. Weisburd, Elizabeth Groff, and Nancy Morris

### Highlights

This bulletin summarizes the results of a study that reviewed the distribution of juvenile crime in Seattle. The researchers geographically mapped the crime incidents in which a juvenile was arrested to identify the rates and hot spots of juvenile crime in the city. Key findings include the following:

- Fifty percent of all juvenile crime incidents occurred at less than 1 percent of street segments—an area that includes the addresses on both sides of a street between two intersections. All juvenile crime incidents occurred at less than 5 percent of street segments.
- Juvenile crime was concentrated in public and commercial areas where youth gather—schools, youth centers, shops, malls, and restaurants—rather than residential areas.
- Crime rates often vary from one street segment to the next, suggesting that police efforts targeting these hot spots can reduce crime.
- Many juvenile crime hot spots coincide with areas where youth congregate, which indicates that closer supervision of these public places, in the form of place managers or patrols, may help lower juvenile crime rates in those areas.





## Hot Spots of Juvenile Crime: Findings From Seattle

David L. Weisburd, Elizabeth Groff, and Nancy Morris

Over the past decade a substantial body of research has documented the importance of understanding the role location plays in efforts to control crime (Eck and Weisburd, 1995; Sherman, 1995; Taylor, 1997; Weisburd, 2002). A series of studies has shown that crime clusters in small geographic units termed crime hot spots (Brantingham and Brantingham, 1999; Crow and Bull, 1975; Pierce, Spaar, and Briggs, 1986; Roncek, 2000; Sherman, Gartin, and Buerger, 1989; Weisburd, Maher, and Sherman, 1992; Weisburd and Green, 1994; Weisburd et al., 2004). Researchers have found this concentration of crime to be stable across relatively long periods of time (Weisburd et al., 2004). The clustering of crime at hot spots over time has important implications for where and how police and communities can best allocate and deploy resources to prevent and reduce crime.

Despite this growing evidence of the concentration of crime in specific locations, studies to date have dealt primarily with adult crime or have not distinguished between adult and juvenile offenses. Although researchers have long been interested in where juvenile delinquents live (Bursik and Webb, 1982; Schuerman and Kobrin, 1986; Shaw and McKay, 1969; Sickmund, Snyder, and Poe-Yamagata, 1997), they have largely ignored where juveniles commit their crimes (for exceptions, see Stephenson, 1974; Turner, 1969).

The failure to look at how juvenile crime is distributed across small geographic units is surprising given that routine activity theory (Cohen and Felson, 1979) stresses the importance of looking at where crimes occur (Sherman, Gartin, and Buerger, 1989; Smith, Frazee, and Davison, 2000). According to this theory, a crime is more likely to be committed at times and places where suitable targets, a lack of capable guardianship, and motivated offenders come together. A number of empirical studies suggest that where crimes occur is strongly linked to the routine activities of potential offenders and victims (Brantingham

and Brantingham, 1975, 1991; Duffala, 1976; Hunter, 1988; LeBeau, 1987; Mayhew et al., 1976; Rengert, 1980, 1981). Because juveniles are likely to have limited “activity spaces” (i.e., areas they are familiar with and visit routinely), routine activity theory would predict very high concentrations of juvenile crime at specific places.

This bulletin provides findings from the first examination of the concentration of officially recorded juvenile crime at street segments<sup>1</sup> in Seattle, WA, during a 14-year period from 1989 to 2002. The study measured juvenile crime by “juvenile crime incidents” or crime incidents in which at least one juvenile ages 8 to 17 was arrested. The study tried to answer four main questions:

- Is juvenile crime concentrated in crime hot spots?
- To what extent are developmental trends in juvenile crime stable or variable over time?
- Where are juvenile crime hot spots located in the city, and are they clustered in specific areas?
- What risk factors are related to the concentration of juvenile crime in specific places?

The study found that juvenile crime in Seattle was concentrated in the same relatively small number of hot spots over time, and that those hot spots were concentrated in “juvenile activity spaces” (areas where young people congregate), such as schools, youth centers, shops, malls, and restaurants. Focusing police and community crime prevention efforts on these areas and providing more supervision for youth in those areas through the introduction of “place managers”<sup>2</sup> could significantly reduce juvenile crime.

### Sources of Data on Juvenile Crime in Seattle

The study data are drawn from reported juvenile crime incidents (incidents in which at least one juvenile was

arrested) at street segments in Seattle from 1989 through 2002. The relevance of small areas in organizing city life has long been recognized (Appleyard, 1981; Jacobs, 1961; Smith, Frazee, and Davison, 2000; Taylor, 1997). Moreover, the choice of street segments over smaller units such as addresses (Sherman, Gartin, and Buerger, 1989) minimizes likely errors from the miscoding of addresses in official data (Klinger and Bridges, 1997; Weisburd and Green, 1994).<sup>3</sup>

## Identifying Juvenile Crime Incidents

The study sought to identify trends of juvenile crime at micro places. The first challenge was to find a method for identifying when a crime involved a juvenile offender (ages 8–17). Prior studies of crime at micro places have generally relied on emergency calls to the police or officially recorded crime incidents. However, neither of these records the age of the offenders. Arrest reports provide the most accurate listing of the ages of suspects, but they measure offenders, not offenses. This study sought to measure how many crimes were committed at a specific street segment, not how many offenders had been arrested there. Researchers linked arrest reports, which identify all juvenile offenders, to incident reports to identify crime incidents in which at least one juvenile offender was arrested. These events are termed “juvenile crime incidents” to distinguish them from arrests per se—as multiple juvenile arrests may result from a single incident—and from incident reports more generally.

## Geographic Concentration of Juvenile Crime

The first question concerns the extent of concentration of juvenile crime into crime hot spots. Figure 1 displays the overall annual trend of crime incidents in which police arrested a juvenile at a street segment in Seattle during the study period. The trend mirrors the overall crime trend for Seattle (Weisburd et al., 2004) and the nation (Blumstein and Wallman, 2000). Incidents peaked in 1993 and decreased sharply from 1994 to 2002. From 1989 to 2002, Seattle street segments experienced a 41-percent decline

Figure 1. Distribution of Juvenile Crime Incidents at Seattle Street Segments, 1989–2002

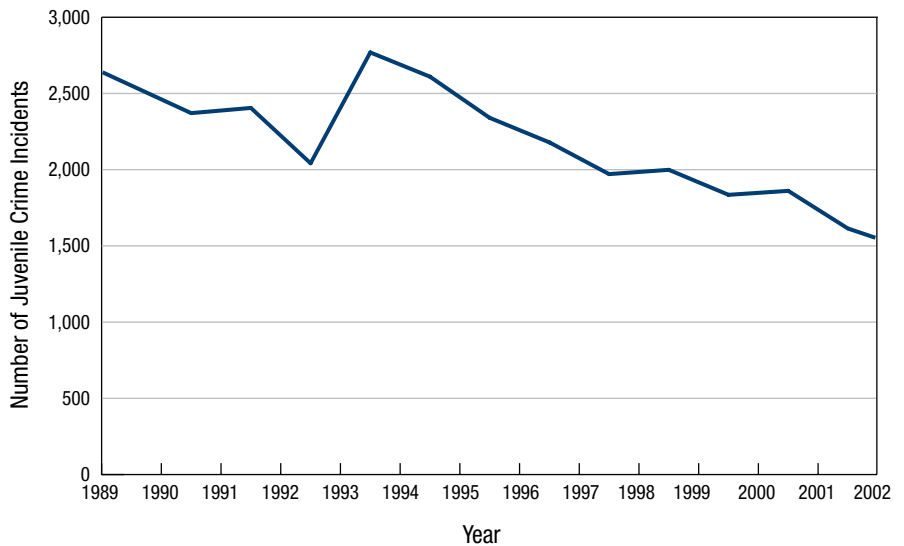
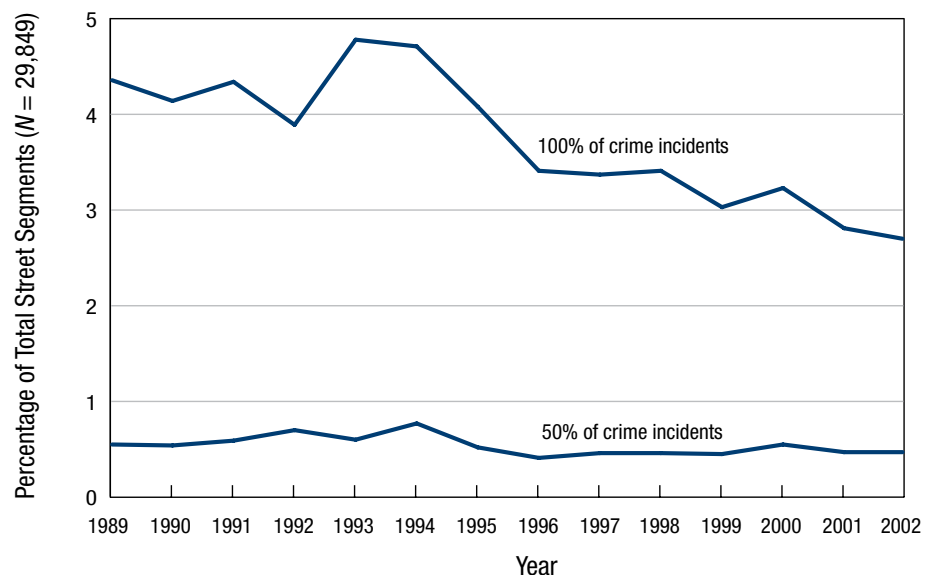


Figure 2. Concentration of Juvenile Crime Incidents at Seattle Street Segments, 1989–2002



in juvenile crime incidents. Figure 2 presents the percentage of street segments that account for 50 percent and 100 percent of juvenile crime incidents each year. During any given year, all juvenile crime incidents occurred in 3 to 5 percent of Seattle’s 29,849 street segments, and 50 percent occurred in less than 1 percent of street segments.

These data suggest that juvenile crime incidents were highly concentrated in each year of the period studied and that this concentration of juvenile crime by location was fairly stable across the 14 years examined. However, they do not, by themselves, indicate whether the same street segments evidence high numbers of juvenile crime incidents from year to year or vary greatly in the number of crime incidents across time. Such questions are important

in drawing policy conclusions regarding crime hot spots from the data. If high-rate juvenile crime hot spots moved from one street segment to another across the study period, focusing crime prevention on juvenile crime hot spots would provide little benefit.

## Group-Based Trajectory Analysis

This study used group-based trajectory analysis (Nagin and Land, 1993; Nagin, 1999, 2005) to answer these questions.<sup>4</sup> The street segments were clustered into eight groups with distinct developmental trends over the time period studied (see the sidebar, “Trajectory Group Modeling,” for more information about how the researchers classified the groups).

Table 1 shows the average number of juvenile crime incidents for street segments in each of the eight trajectory groups across the 14 years of the study. The table confirms that the vast majority of street segments had very little or no juvenile crime, as measured by crime incidents throughout the time period. For example, group 2 contains approximately 89 percent of all street segments, but accounted for only 12 percent of all juvenile crime incidents during the period of study.

This analysis reinforces the earlier finding regarding the concentration of juvenile crime incidents. Perhaps most striking about table 1 is the substantially higher average level of incidents that a relatively small number of street segments exhibited. Although groups 6, 7, and 8 include only 0.29 percent ( $n = 86$ ) of the 29,849 street segments in the city, about one-third of all juvenile crime incidents occurred at those street segments during the 14-year period studied. However, the clustering in some degree may be due to concentrations of police patrols rather than juvenile crime incidents themselves (see p. 9).

## Geographic Stability and Variability in Juvenile Crime Over Time

The eight trajectory groups show considerable stability in levels of officially reported juvenile crime among street segments over time (see table 1). Street segments in group 7 had the highest level of juvenile crime incidents at both the outset and the end of the study period, and group 7 remained the highest level trajectory throughout the study period. Group 8, which began with the third highest average juvenile arrest rate for street segments, had the second highest rate at the end of the study. Similarly, groups 1, 2, and 3 had very low levels of juvenile crime incidents at

Table 1. Average Number of Crime Incidents per Street Segment in Each Trajectory Group, 1989–2002<sup>1</sup>

Year	Group 1 ( $N = 297$ ) <sup>2</sup> (1.00%) (Low crime, increasing)	Group 2 ( $N = 26,503$ ) (88.79%) (No crime, stable)	Group 3 ( $N = 2,558$ ) (8.57%) (Low crime, stable)	Group 4 ( $N = 338$ ) (1.13%) (Moderate to low crime, decreasing)	Group 5 ( $N = 67$ ) (0.22%) (Moderate crime, increasing)	Group 6 ( $N = 40$ ) (0.13%) (High crime, decreasing)	Group 7 ( $N = 8$ ) (0.03%) (Highest crime, stable)	Group 8 ( $N = 38$ ) (0.13%) (High crime, increasing)
1989	0.08	0.01	0.29	1.46	1.36	8.90	31.38	6.21
1990	0.07	0.01	0.26	1.45	1.36	7.63	31.75	6.76
1991	0.12	0.01	0.28	1.38	1.66	6.43	28.25	7.18
1992	0.15	0.01	0.23	1.04	1.76	5.48	23.38	5.97
1993	0.22	0.01	0.32	1.41	2.09	7.40	29.25	9.95
1994	0.28	0.01	0.33	1.31	2.03	5.85	27.25	8.63
1995	0.37	0.01	0.35	1.05	2.37	4.58	30.50	9.68
1996	0.40	0.01	0.20	0.88	2.60	3.28	42.25	10.39
1997	0.57	0.01	0.18	0.74	2.40	3.25	38.13	6.87
1998	0.97	0.01	0.18	0.63	2.90	2.20	27.75	8.84
1999	0.80	0.01	0.15	0.49	3.15	2.17	27.00	9.26
2000	0.99	0.01	0.15	0.53	2.82	2.33	25.63	8.29
2001	0.89	0.01	0.12	0.38	2.49	2.00	19.25	8.42
2002	1.00	0.01	0.12	0.41	2.45	1.25	17.88	5.76

<sup>1</sup> The total number of juvenile crime incidents in Seattle during the period 1989–2002 was 30,004.

<sup>2</sup>  $N$  is the number of street segments in each group. The total number of street segments in Seattle is 29,849.

street segments at both the start and the end of the study period.

Although most of the trajectory groups exhibited decreasing trends over time that were consistent with the overall crime decline in Seattle, some groups showed an increase in juvenile crime incidents during this time period. Street segments in group 5 began with an average number of

crime incidents (close to 1 in 1989) but steadily increased through the late 1990s to an average of almost 2.5 events per year. Although only 67 street segments are found in this group, it represents an interesting pattern because it goes against the overall citywide trend in Seattle.

Groups 6 and 8 illustrate that the initial level of juvenile crime incident activity at places does not necessarily

## TRAJECTORY GROUP MODELING

Trajectory group analysis is a type of group-based modeling that is designed to identify groups of cases with similar patterns over time within a population (trajectories) and to estimate the proportion of the sample classified into each trajectory. Group-based analysis identifies groups within a population that follow distinctive developmental trajectories (i.e., clusters within the population that show progress toward different outcomes over time, such as increasing, decreasing, and stable). The term “developmental trajectory” was first applied to trends in antisocial behavior among youth as they grow older, but it describes the progression over time of any phenomenon—biological, behavioral, or physical—such as time trends in reported crime across street segments, as in this study.

It is important to emphasize, however, that these trajectory groups are not inherently real or immutable over time (Nagin, 2004, 2005). As with all statistical analyses, trajectory analysis is an approximation of reality and is driven primarily by the data used to produce estimates. In addition, as with virtually all statistical approaches, methodological issues pertaining to the time span studied and the quality of the data substantively affect the findings (Eggleston, Laub, and Sampson, 2004; Nagin, 2004). Moreover, because trajectory analysis is a statistical approximation of reality, it can never reproduce that reality without error, and thus some degree of accuracy is lost (Nagin, 2004). However, simulation studies of trajectory analysis approximations have suggested that this loss is rather small, and the flexibility and descriptive utility of the method arguably outweigh these drawbacks (Brame et al., 2004; Nagin, 2004).

In applying trajectory group analysis across the street segments in Seattle, the researchers came up with a number of findings. First, even assuming a random distribution of juvenile arrests across street segments in Seattle, the vast majority of street segments would report no crime, as fewer than 3,000 arrests per year occurred across nearly 30,000 street segments. However, statistical analysis showed that the number of street segments that reported no crime was significantly greater than chance would predict. In addition, although a random distribution of crime

incidents would indicate that virtually no street segments would have three or more juvenile crime incidents each year, the observed frequencies show that large numbers of street segments have three or more incidents. Therefore, crime across street segments was significantly more concentrated than chance would predict.

After fitting a number of groups to the data and assessing model fit using several diagnostics, the researchers chose an eight-group model (see table 1 on p. 4).<sup>1</sup> Groups 1 through 4 were larger groups that showed low and generally stable crime rates. Group 1, with a low but slightly increasing crime trajectory, contained 297 street segments. Group 2, the stable, no-crime trajectory, contained the vast majority of street segments (26,503 street segments). Group 3, which showed a stable, low-crime trajectory, contained 2,558 street segments. Group 4, which showed a moderate but decreasing crime trajectory, had 338 street segments. Together, groups 1 through 4 comprised more than 99 percent of the street segments in the study. Groups 5 through 8, which had higher crime rates, were much smaller, with fewer than 100 street segments in each. Group 5 (67 street segments) showed an intermediate but increasing crime trajectory; group 6 (40 street segments) showed a high but decreasing crime trajectory; group 7 (8 street segments) showed the highest crime trajectory, with an initial sharp increase followed by a decrease; and group 8 (38 street segments) showed a high and slightly increasing crime trajectory. Together, groups 5 through 8 comprised less than 1 percent of the street segments but accounted for more than 40 percent of the juvenile crime incidents.

<sup>1</sup> The researchers compared the Bayesian Information Criterion (BIC) generated from each of the models to determine which model best fit the observed data. The BIC is useful for determining the optimal number of trajectory groups and is expressed in the following form:

$$\text{BIC} = \log(L) - 0.5 * \log(n) * (k)$$

where “*L*” is the value of the model’s maximized likelihood, “*n*” is the sample size, and “*k*” is the number of groups. One benefit of the BIC is that it institutes a penalty for increasing the number of groups in the model. Adding more groups is desirable only if the resulting improvement in the log likelihood exceeds the penalty for more groups (Nagin, 2005).



predestine future juvenile crime activity. Street segments in these groups had, on average, relatively similar levels of officially recorded juvenile crime incidents (8.90 and 6.21) in 1989. However, whereas group 8 had an increasing average value for most of the period before a sharp decline in 2002, group 6 had a declining trend through the 14 years, ending with an average of only 1.25 juvenile crime incidents. The differences at the end of the period are statistically significant.<sup>5</sup>

## Geography of Juvenile Crime Trajectories

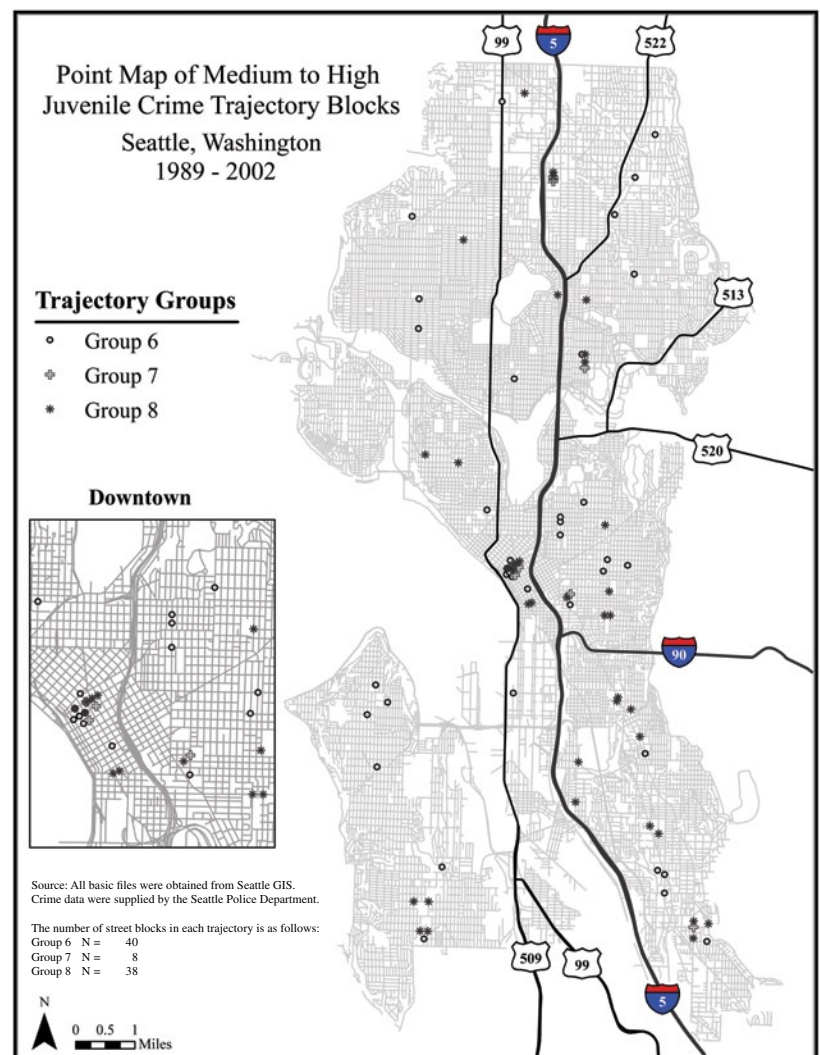
The next set of questions concerns the geography of juvenile crime trajectories. First, are the street segments in the same trajectory group of juvenile crime clustered in specific geographic areas, dispersed across the city, or random? Second, are the trajectories of nearby street blocks related? Third, are street segments of certain trajectories found near one another or not (e.g., do groups 5 and 7 tend to be found close to one another)? Finally, if the data present a systematic pattern, at what scale does the pattern operate? If blocks of a certain trajectory are clustered, are they clustered at the street segment level or across larger areas?

Figure 3 presents the exact location of the high-activity hot-spot street segments (groups 6, 7, and 8) on the Seattle city map. Although the map shows that hot-spot street segments are found throughout the city, they are clearly clustered in the downtown business section (highlighted in the map). But even here, it is useful to note the street-by-street variability in the data.

These initial descriptive findings led the researchers to ask to what degree nearby street segments belonged to the same one of the eight trajectory groups. In a number of areas, nearby street

segments were in different trajectory groups, indicating that local risk factors affect different street blocks. In other areas, however, nearby street segments were in the same trajectory group. Further statistical analysis showed that street segments in each trajectory group were generally found closer to one another than would be expected by chance. This general clustering extends for about 2.4 miles, at least, for all groups except group 8, for which the

Figure 3. Point Map of Medium to High Juvenile Crime Incident Trajectory Blocks, Seattle, 1989–2002



*“The places with the most activity were likely to be malls, restaurants, schools, and youth centers.”*

clustering effect ends at about 1.4 miles.<sup>6</sup> Put more simply, a group 8 street segment is more likely to have another group 8 segment within 1.4 miles than would be predicted if the crime rate were randomly distributed among street segments. Overall, the relatively large distances across which clustering remained significant could point to the operation of community-level risk factors or a cluster of local risk factors with slight geographic separation. Thus, the pattern of trajectory groups is generally clustered rather than random or dispersed, but the clustering is significant at distances that range from street segment to community level.

Next, the study looked at whether street blocks in different trajectory groups were found near one another (e.g., did street segments in group 5 tend to be found near those in group 7?). Direct comparison of street segments belonging to two trajectory groups indicated that relationships between their locations were not statistically significant, reinforcing the finding that crime rates vary from one street segment to another (Groff, Weisburd, and Morris, 2009).

First, street segments in the same trajectory group are significantly more likely to be found in the same general area (within 1.4–2.4 miles for most) than chance would predict.

Second, within specific areas, trajectory group membership varies significantly from one street segment to another. These findings suggest that much knowledge about crime would be missed by looking only at aggregate trends across larger areas such as communities or neighborhoods.

## Risk Factors and Juvenile Crime Hot Spots

Juvenile crime is likely to be highly concentrated geographically, largely because juvenile activity spaces are also concentrated. Data drawn from incident reports confirm the relevance of juvenile activity spaces and routine activity theory for understanding the very high concentration of juvenile crime incidents in Seattle. The incident reports include a field that notes the type of location associated with a specific incident. Table 2 displays trajectory group membership by percentage of crime incidents at specific types of activity spaces.

### Types of Places Where Crimes Are Committed

The highest rate groups (6–8) are less likely than the low-rate groups to include crimes committed at private dwellings. Only 5.2 percent of places where incidents occurred are listed as private dwellings in group 6, and less than 1 percent in groups 7 and 8. By contrast, in the lowest rate groups (1–4), substantially more incidents occurred at private dwellings (between 29.8 and 47.3 percent). Group 5, which has an increasing juvenile crime rate across the time period and forms an intermediate-rate trajectory, is closer to groups 6 through 8, with only 14.3 percent of incidents occurring at private dwellings.

In the highest rate groups, crime incidents were much more likely to occur at public places than in low-rate groups.

In each of the low-rate groups (1–4), less than 4 percent of the crime incidents occurred at schools or youth centers.

Table 2. Trajectory Group Membership by Location of Incident

Group	Schools, Youth Centers	Shops, Malls, Restaurants	Streets, Alleys, Public Spaces	Private Dwellings	Bars, Clubs, Taverns	Other	Total*
1	1.9%	10.2%	32.1%	47.3%	0.2%	8.3%	100.0%
2	1.8%	2.1%	53.7%	34.3%	0.1%	8.0%	100.0%
3	2.9%	4.8%	43.3%	40.1%	0.3%	8.6%	100.0%
4	3.9%	14.3%	42.5%	29.8%	0.2%	9.3%	100.0%
5	6.5%	26.0%	40.7%	14.3%	0.4%	12.2%	100.0%
6	17.1%	34.3%	32.5%	5.2%	2.5%	8.4%	100.0%
7	12.7%	75.4%	8.8%	0.2%	0.1%	2.9%	100.0%
8	30.7%	38.9%	21.5%	0.7%	0.0%	8.0%	100.0%

\*Totals may not add up to 100% because of rounding.

However, in groups 6, 7, and 8, respectively, 17.1 percent, 12.7 percent, and more than 30 percent of juvenile crime incidents occurred at a school or youth center. The difference between the high-rate and low-rate groups in the proportion of crime incidents at shops, malls, and restaurants is even more pronounced. Although less than 15 percent of incidents in each low-rate group (1–4) occurred at these locations, between 34.3 and 75.4 percent of crime incidents in groups 6 through 8 occurred there. Again, group 5 formed an intermediate group in terms of both the frequency and the location of crime incidents.

These data support the assumption that juvenile crime is concentrated geographically because juvenile activity spaces are concentrated geographically. Incidents in the highest rate trajectories are most likely to be found at and around places where juveniles congregate. This means that hot spots of juvenile crime, as evidenced by crime incidents, are likely to be located in those places. Not surprisingly, very few juvenile crime incidents occurred at bars, clubs, and taverns. Although they are prominent activity places for adults, and often crime hot spots (Roncek and Bell, 1981; Roncek and Maier, 1991), they are not for juveniles.

### Presence of Potential Juvenile Offenders

These findings raise the question of whether other risk factors associated with crime affect developmental trajectories of juvenile crime at street segments. A key factor in juvenile crime is the presence in an area of large numbers of juveniles, especially potential juvenile offenders (see table 3). Researchers measured the student population by summing the total number of public school students on each street segment. Chronic truants (students with 10 or more unexcused absences in a year) were identified as potential offenders.

Following routine activity theory, juvenile crime rates would be expected to be higher on a block where more juveniles (more potential victims) lived. The average number

of students living on a block is relatively small in group 2, which represents a stable, no-crime trajectory that includes 89 percent of the street segments in the city. However, group 7, which represents the highest crime street segment group, has even fewer students per street segment. Although street segments in moderate-crime groups 4 and 5 and high-crime group 6 have the largest average number of students, street segments in group 1, which is a stable, low-crime trajectory, are close behind.

In the case of chronic truancy, routine activity theory would again predict higher crime rates in places where potential offenders are found. Although the data show that the average number of chronic truants is small in the stable, no-crime group 2 (0.07), it is also small in street segments in high-crime groups 7 and 8. The largest number of truants per segment is found in group 5, which has a moderate but increasing crime trajectory.

Although a clear picture cannot be drawn from these data, the study findings regarding activity spaces suggest the complexity of the application of traditional opportunity theories to data on juvenile hot spots. As noted earlier, the places with the most activity were likely to be malls, restaurants, schools, and youth centers. This suggests that the highest levels of juvenile crime are likely to be found not on streets where young people live but at locations that they travel to for recreation, education, or work. Accordingly, activity spaces and land-use patterns that bring offenders and victims together in the absence of suitable guardianship likely explain the relatively small numbers of chronic truants and students who live at the highest rate trajectories. This is not to say that the number of students or chronic truants living on a block is unrelated to crime at the street segment. The very small numbers of chronic truants found in the stable no-crime trajectory (group 2) and the higher rates of truancy found in low- to moderate-level crime trajectories suggest that these factors operate at some level on the street segments where juveniles live.

Table 3. Risk Factor Analysis: Average Number of Students and Chronic Truants per Street Segment by Trajectory Group

Classification of Trajectories	Student Population (1992–94)	Student Population (2000–02)	Chronic Truancy (1992–94)	Chronic Truancy (2000–02)
Group 1	5.48	6.41	1.14	1.20
Group 2	0.75	0.83	0.10	0.07
Group 3	3.63	3.50	0.75	0.50
Group 4	9.88	7.36	2.41	1.31
Group 5	11.54	14.93	2.60	2.78
Group 6	9.51	8.38	1.54	1.04
Group 7	0.58	0.04	0	0
Group 8	1.89	1.46	0.36	0.21

### Limitations on Data Analysis

These findings are the first to describe the distribution of juvenile crime across micro units of geography and thus provide significant new data on the relationship between juvenile crime and place. Nonetheless, the data have important limitations.



## Effects of Underreporting of Juvenile Crime

First, is it reasonable to conclude that arrests of juvenile offenders reflect juvenile offending patterns generally? Although it has long been assumed that juvenile crime is particularly prone to reporting biases, recent research suggests that for juveniles, as for adult offenders, official data and self-report data are consistent in identifying overall offending patterns (Brame et al., 2004). Juvenile crime is severely underreported, even compared with adult crime, either because crimes are not detected or police choose not to pursue an arrest (Erickson and Empey, 1963; Gold, 1966; Williams and Gold, 1972; Rosenbaum, 2006; Weisburd, Morris, and Groff, 2009; Sibley et al., 2010; Elrod and Ryder, 2011).

Brame and colleagues (2004, p. 269) conclude that juveniles “who are arrested more often tend to self-report involvement in offending at greater levels than those who have been arrested less often.” The Seattle study data identified only 30,004 crime incidents in which a juvenile was arrested, a figure that certainly underestimates the number of juvenile crimes in Seattle during the study period. However, if Brame and colleagues’ analyses of individual juvenile offending can be extrapolated to juvenile crime incidents at places, it is reasonable to conclude that the study data, although underestimating the frequency of juvenile crime incidents, reflect more broadly the overall concentration of juvenile crime.

The approach used in this study is the only method that the researchers know of, at this time, to identify where juvenile crime is committed in the city, given available data sources. It is clear, however, that reliance on arrest data to identify the age of offenders involved in a crime incident limits the ability to draw direct conclusions regarding juvenile crime itself. The fact that the current study findings are consistent with a series of prior studies that indicate strong concentration of crime at places (Eck and Weisburd, 1995; Sherman, 1995; Taylor, 1997; Weisburd, 2002), and with the assumptions of routine activity theory more generally, gives them added weight.

Having identified the presence of juvenile crime hot spots in official crime data, it is important for other scholars to



examine these trends across other urban contexts and to explore different methods of data collection. For example, Oberwittler and Wikström (2009) examine the location of crime events for juveniles from self-report studies in the United Kingdom. Although such data do not allow for an accounting of crime events outside the sample, they would allow for examination of clustering of crime within the samples examined.

## Effects of Police Enforcement Priorities

Second, do the study data represent the location of crimes or the priorities of police enforcement? Police activities are not random. Patrol and other resources tend to be concentrated in and around schools and stores and other commercial areas, which might lead to greater concentrations of arrests in those places. The data in this study, as in more general geographical studies of crime that rely on official crime information, reflect these biases; however, other influences on police resource allocation suggest that they may be less consequential than is sometimes assumed. In large part, police allocate resources on the basis of citizen requests through emergency response systems rather than the priorities of police executives (Mazerolle et al., 2005; Sparrow, Moore, and Kennedy, 1990).

This means that the concentration of police presence is strongly related to where citizens or business owners identify crime, and suggests that the distribution of police resources does follow, at least to some extent, the distribution of crime as it is known to crime victims in the city.

*“The study suggests a strong relationship between juvenile activity spaces and hot spots.”*

In this context, it is not surprising that similar portraits of crime concentration are found when identifying specific types of hot spots (e.g., for drugs and disorder) using arrests, incidents, or calls for service (Lum, 2003; Weisburd and Green, 1994).

Nonetheless, police priorities may affect the distribution of crime as measured by juvenile crime incidents. Although there is no direct way to assess the extent of this bias, the distribution of offenses in the study data indirectly measures proactive police activities. High rates of drug-crime arrests or arrests for disorderly behavior are much more likely to reflect proactive policing efforts at particular places, as such arrests are often the immediate result of police observing such behaviors on the street. In this study, 22.3 percent of the juvenile crime incidents recorded were for disorder, drugs, or prostitution, which differs little from a study of crime incidents generally in Seattle, where 17 percent of incidents were so classified (Weisburd et al., 2004). In the three highest rate trajectory groups, the proportion of incidents categorized as disorder, drugs, or prostitution was even smaller, ranging between 2.9 and 13.6 percent of arrests. Although these data do not provide conclusive evidence regarding the impact of proactive enforcement on the study findings, they suggest that such influences may not be greater than those found in prior studies of crime more generally.

## Implications of the Study Findings for Policing and Supervision of Juveniles

This study provides the first portrait of the distribution of officially recorded juvenile crime events across micro units of geography. Crime incidents in which a juvenile is arrested, like crime in general (Brantingham and Brantingham, 1999; Crow and Bull, 1975; Pierce, Spaar, and Briggs, 1986; Roncek, 2000; Sherman, Gartin, and Buerger, 1989; Weisburd, Maher, and Sherman, 1992; Weisburd and Green, 1994; Weisburd et al., 2004), are concentrated at crime hot spots over time. Those crime hot spots do not simply represent larger geographic concentrations of juvenile crime but also point to the importance of

individual street segments and other small geographic units in understanding juvenile crime. Finally, the study suggests a strong relationship between juvenile activity spaces and juvenile crime hot spots.

The fact that so great a proportion of juvenile crime incidents are found in so few street segments suggests significant opportunities for policing and crime prevention more generally. A strong body of evidence indicates that police efforts focused on crime hot spots can reduce crime and disorder in those areas without simply moving them elsewhere (Braga et al., 1999; Braga and Weisburd, 2010; National Research Council, 2004; Weisburd and Eck, 2004; Weisburd et al., 2004). This study's findings suggest that juvenile crime hot spots offer an important opportunity for crime prevention.

But are the police the right agents to address juvenile crime hot spots? Rosenbaum (2006) points out that targeted policing of juvenile hot spots may lead unnecessarily to labeling and stigmatizing of young people that may have long-term negative consequences. Moreover, research on juvenile crime suggests that altering the supervision and structure of juvenile activities can prevent delinquency (Osgood et al., 1996). One reason that hot spots of juvenile crime incidents cluster in juvenile activity spaces may be that those areas are not adequately structured and supervised. A number of scholars have pointed to the importance of place managers<sup>7</sup> in preventing crime at places (Eck, 1995; Eck and Weisburd, 1995; Eck and Wartell, 1998, 1999; Madensen and Eck, 2007; Maze-rolle, Kadleck, and Roehl, 1998; Stokes, 2002; Tillyer, Fisher, and Wilcox, 2007). It may be that place managers are particularly important in creating supervised socializing for young people. The study findings of strong concentrations of juvenile crime at hot spots suggest that introducing place managers in a small number of places might have strong crime prevention benefits.

The high concentration of juvenile crime incidents in Seattle points to the importance of place-based crime prevention for reducing juvenile crime. By addressing a relatively few street segments in the city, police or other crime prevention authorities can potentially target a large proportion

*"But are the police the right agents to address juvenile crime hot spots?"*

of officially recorded juvenile crime. The finding of stability across time further reinforces the importance of place-focused crime prevention. If the most active hot spots are likely to stay active over time, they provide a stable focus for intervention. Although place-based crime prevention has not been a major focus of delinquency prevention, it may be an area with great promise.

## Endnotes

1. A street segment includes addresses on both sides of a street between two intersections. Normally, a street segment in Seattle is delimited in multiples of 100. For example, if a map lists a street as spanning house numbers 1 through 399, this range would comprise four street segments: 1–99, 100–199, 200–299, and 300–399. There are 29,849 street segments in Seattle.

2. Place managers are persons or organizations that take responsibility for the safety, security, and orderly functioning of public and private communal spaces and for controlling the behavior of people who use those spaces (Eck, 1995). They discourage crime through their presence or, more strategically, through their connections to formal systems of surveillance and social control (Eck and Weisburd, 1995). They may be professionals, such as managers of apartment complexes (Eck and Wartell, 1998, 1999), security staff at a mall or in the commercial areas of a downtown business district or companies that employ such staff (Stokes, 2002), or uniformed security staff within a school (Tillyer, Fisher, and Wilcox, 2007). They may, however, also be homeowners; block captains; storeowners and employees; bartenders or restaurant staff; schoolteachers, students, and administrators; or even regular users of a space, such as picnickers who help maintain the neatness and order of a park (Eck and Wartell, 1998; Madensen and Eck, 2007; Mazerolle, Kadleck, and Roehl, 1998; Stokes, 2002; Tillyer, Fisher, and Wilcox, 2007). Eck and Wartell (1998) delineate four categories of place managers: personal managers (e.g., storeowners, homeowners, and other individual property owners), assigned managers (e.g., professional building or property managers, retail employees, bartenders, lifeguards, and librarians); diffuse

managers (e.g., delivery truck drivers); and general managers (e.g., store customers, park users, and library patrons).

3. The use of a street segment rather than an area (i.e., neighborhood, census tract, block group, ZIP code) also avoids coding issues that have been identified when trying to delimit socially defined geographic units such as a neighborhood (Sampson, Morenoff, and Gannon-Rowley, 2002; Suttles, 1972).

4. See Weisburd, Morris, and Groff (2009) for a full description of the trajectory analysis approach used here.

5. A 95-percent confidence interval (CI) was constructed around the average point estimate in 2002 for groups 6 (95% CI: 1.08–1.55) and 8 (95% CI: 5.94–7.09) to ensure that their end points did not overlap and were significantly different. Confidence intervals indicated that each point estimate was distinct.

6. Group 7 is not included because it has only eight observations, making statistical results unreliable.

7. See endnote 2 for a definition of place managers. For an example of the application of place management principles in an urban commercial area, see Stokes (2002). Stokes describes the use of customer service representatives (CSRs) as place managers in the Center City District, a business improvement district in downtown Philadelphia. The 40 CSRs, who are employed by the district, combine security and public relations functions, each patrolling two beats per shift. Their main activities are providing hospitality, information, and other services to the public; controlling nuisance behavior; and identifying homeless persons and directing them to social service providers. Their crime prevention role is to act as a problem-solving resource and to play a custodial role secondary to that of the police. They patrol the same beats as police but are



unarmed and have been instructed to avoid direct involvement in responding to crime (i.e., conflict with citizens and making arrests). They radio police dispatch for assistance in these situations and share dispatch facilities with the local police substation. In addition to patrolling beats, their duties include regular visits to merchants (two per shift), providing crowd control at special events, providing crime prevention training to retailers and office workers, and discouraging panhandling at events in the live theater district. Although no data are presented on reduction in crime in the Center City District as a result of the introduction of the CSRs, public perception of the district's safety increased from 44 percent in 1994 to 77 percent in 1999 (Stokes, 2002).

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