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Evaluation of the Youth Curfew in Prince George's County, Maryland

The Curfew's Impact on Arrests and Calls for Service

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research for safer communities

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Introduction

During the last decade over 200 localities around the country have imposed curfews or renewed curfew enforcement in an attempt to curtail youth crime and violence. A recent survey of municipal police departments serving populations over 15,000 found that almost 70 percent of jurisdictions responding had juvenile curfews (Bannister, Carter, and Schafer, 2001). According to the FBI's Uniform Crime Reports, there were 149,800 arrests for curfew and loitering violations in 1995, a 50 percent increase from 1992 (U.S. Department of Justice, 1997). Many jurisdictions declare that curfews benefit government officials, police officers and residents alike. Parents often feel that curfews provide support for parental restrictions on unsupervised activities that would take place late at night.

The popularity of the curfew as a means of "breaking the cycle" of youth crime and violence demands continued independent evaluation. The research conducted for this report builds on previous findings from the Urban Institute's examination of the impact of Prince George's County, Maryland's youth curfew on victimizations. The project utilized a quasi-experimental design using ARIMA models, a spatial analysis of the concentrations of violence, and a process analysis documenting that the curfew in Prince George's County is being enforced (Gouvis, 2000).

Records from Prince George's County indicate enforcement of the curfew. From July 1, 1996 (the date of implementation of the curfew) to March 31, 1999, Prince George's County police recorded over 2,000 violations. Although arrests are not made when youth violate the county curfew, they are told to return home, and the violation is recorded, with a letter sent to the parents indicating that a fine will be issued if the youth violates the curfew a second time. The research on the curfew's impact on victimizations found that Prince George's County's curfew did not significantly reduce violent victimization of youth within curfew age (12 to 16),[1] but was correlated with a significant reduction in victimization to older youth and young adults, ages 22-25.

The research discussed here extends the examination of the curfew's impact on victimization to arrests and calls for service. An evaluation solely examining violent victimization is not sufficient for fully understanding the effects of a popular measure to reduce crime and protect citizens. Reported victimizations can significantly undercount actual criminal incidents. An OJJDP study reported that only 28 percent of violent crimes against youth are reported to law enforcement (Snyder and Sickmund, 1999). Furthermore, it is possible that the county's curfew had an impact on *victimless* crimes, such as vandalism or drug dealing. Using arrest data as the dependent variable illuminates possible effects of the curfew on property crimes and drug crimes. Calls for service data provide an additional measure of crime and crime-related activity, such as juvenile disturbances, that cannot be captured with arrests or reported victimizations. Juvenile disturbances may cause little tangible harm, but they often signal that things are out of control, which can lead to an increase in fear of crime (Skogan 1986, 1990). If a curfew's intended impact is to protect society by removing youth from the street, citizen

[1] A reduction in victimization to youth within curfew age was found, but it was not significant.

calls for juvenile disturbances should be an appropriate measure to capture changes in the presence of unruly youth. This study, incorporating a calls for service and arrest analysis into the victimization study, yields a comprehensive assessment that can aid other jurisdictions developing curfew laws in understanding where a curfew's effects may appear, whether it be reductions in disturbance calls, reductions in arrests or a decrease in reported violence.

This research also expands the geographic information system (GIS) analyses conducted in the first report to include calls for service. Spatial analysis of calls for service may help illuminate patterns and trends in youth crime that exist but were difficult to uncover using only violent victimization as the dependent variable. Because violent crime is considered more spontaneous than property crime, it may be that an examination of changes in spatial concentrations of calls for service is more suitable to GIS analysis than an examination of changes in high violence areas. The spatial analysis of victimization showed that there may have been a temporary spatial shift in hotspot areas after the curfew began, but high victimization areas remarkably remained stable over the seven-year period of study.

Overall, Prince George's County offers several advantages as the site for an evaluation of youth curfews. One barrier limiting research on youth curfews in many jurisdictions is poor police record data--records with large amounts of missing data on age of victim or time of day of victimization. However, Prince George's County incident records are sufficient in both size (i.e., numbers of incidents) and completeness to create a solid evaluation of their curfew ordinance. In recent years, youth have accounted for one-third of arrests for aggravated assaults and robbery in PGC (Pan, 1996). The nature of PGC's curfew ordinance lends itself to an intervention analysis because the county conducted a large-scale campaign to educate parents and youth about the law's requirements, and did not initiate a comprehensive set of youth programming and services to go along with the curfew as did the often-in-the-news curfew cities of Dallas and Phoenix. Thus, onset and operation of the intervention--curfew enforcement--is clear cut in the case of PGC.

For a discussion of the theory behind youth curfews and their historical and constitutional background, see the first report, "Evaluation of the Youth Curfew in Prince George's County, Maryland: The Curfew's Impact on Victimization." The section below provides a brief review of the literature also found in the first report.

The Statistical Research: A Literature Review

As the number of public officials praising their local curfews grows, researchers are beginning to challenge the way the crime statistics are being gathered and used to support the new laws. Evidence regarding the effectiveness of youth curfews is largely absent, and the appeal of the concept is still largely intuitive. Furthermore, local authorities typically measure curfew effects using arrest rates. Using arrest rates confounds effects of offenders' behavior and enforcement policy (Blumstein et al., 1986). Law enforcement agencies which heavily enforce curfews will have more arrests, and it is very difficult to determine at what point in time arrests should begin to decrease due to

curfew enforcement. Furthermore, almost all of the evaluations that exist come from within the jurisdiction where the curfew is taking place--either the mayor's office or the police department itself. The paucity of research is surprising given the abundance of articles in the popular media espousing curfews.

The reported results from the survey by the U.S. Conference of Mayors did not distinguish between "success" based on anecdotal evidence and "success" based on official statistics. The report discusses the reduction of "crime" but does not provide any detail as to whether crime means *any reported offenses*, *arrests* or *victimizations*. In a recent study, two researchers analyzed arrest records, reported crime and mortality data from jurisdictions throughout California for 1980 through 1997 and found that there is no support for the hypothesis that localities with curfews experience lower crime levels, accelerated youth crime reduction or lower rates of violent death than localities without curfews (Males and Macallair, 1999). Their literature review on curfew studies found only twenty-five studies of curfews nationwide, and most were philosophical in nature, not analytical.

This author's review of the literature found six studies, in addition to Males and Macallair (1999), which utilized rigorous statistical analyses. Hunt and Weiner (1977), analyzing Detroit's curfew law, found that index offenses decreased during curfew hours for the first month after implementation, but that there was an increase in these offenses between 2 and 4 p.m. A similar effect was found in an empirical examination of arrest rates in Cincinnati. The authors found that juvenile arrests decreased slightly during curfew hours after curfew implementation, but arrests increased during non-curfew hours while not increasing overall (Wright, Hurst, and Sundt, 1995). A more recent analysis of the impact of curfew laws on juvenile crime (McDowall, Loftin and Wiersema, 1999) examined county-level data of large American cities, and found limited evidence that curfews may be effective in reducing juvenile crime rates. The authors examined the effect of arrests for curfews on other arrests and found no evidence that curfew arrests reduce juvenile arrests for other crimes. In addition, they evaluated curfews' impact on homicide using vital statistic counts of homicide victims age 17 or younger for a number of counties. The study found no impact on juvenile homicide victimizations. Reynolds, Seydlitz and Jenkins (2000) studied the impact of the New Orleans' curfew on violent victimizations and found a significant small reduction in victimizations for victims of all ages, but victimization returned to pre-curfew levels shortly after, when enforcement slowed. Reynolds *et al.* found no impact on victimizations when only victimizations of juveniles were examined. Adams (1997), using time series data from four Texas cities to examine the curfews' impact on rates of juvenile offenses, found no consistent evidence that the laws reduced rates of juvenile crime. In contrast, a study evaluating an anti-gang program in Dallas examined two years of time series data and found gang activity decreased in police beats where police aggressively enforced the curfew (Fritsch, Caeti & Taylor, 1999).

The researchers conducting the above studies have emphasized the need for long-term studies and more controlled statistical analyses. McDowall, Loftin, and Wiersema (2000) recommend that future research be conducted on individual cities and on variations in policy in order to help resolve questions about the conditions under which curfews are most likely to be successful.

Prince George's County and It's Curfew Law

Prince George's County is a large, high crime county with no big city. The county's 488 square miles surround the District of Columbia along both the District's northeast quadrant and southeast quadrant. The county has the highest crime rates of all Maryland counties, with the exception of Baltimore City. Home to the University of Maryland, half of the county's 767,413 people are black (51 percent), 43 percent are white, 4 percent are Asian and 4 percent are Hispanic. In 2000 there were an estimated 166,860 youth between the ages of 5 and 19. The average household income is roughly $45,000, and 16 percent of households are female-headed households (Gaquin & Littman, 1999; Maryland Department of Planning, 2000).

The Prince George's County curfew ordinance requires those younger than 17 to be off the streets and out of other public areas from 10 p.m. to 5 a.m. on weeknights and from midnight to 5 a.m. on weekends. The ordinance was passed on November 21, 1995 and enforcement began July 1, 1996. It replaced a 1967 law that permitted police to disperse loitering youth during curfew hours, but included no penalties. Under the 1995 ordinance, youth violating the law are not arrested but are taken into custody until a parent can pick them up. The law set a schedule of fines for violations of the curfew[2]; parents of children who violate the curfew law are fined $50 for the first offense, $100 for the second offense, and $250 for subsequent offenses. Owners of public establishments are fined up to $500 for allowing a juvenile to be in their establishment or on the premises (knowingly) during curfew hours. In addition, the legislation provides for the county to charge parents a "baby sitting fee" if the parents arrive more than one hour after they have been notified that their children are in custody.

Each of the county's six police districts has a Youth Services Officer (YSO), whose role is to process curfew violations. When a youth is stopped on the street by a police officer, the officer is required to fill out a form that contains the youth's demographic information and the nature of the police stop. The officer indicates whether the youth was in violation of the curfew. For those forms where an officer has indicated a curfew violation, the YSO sends a letter to the parent(s) to inform them that their child violated the curfew. Although the curfew regulation states that for a first offense the parent receives a $50 fine, the YSOs generally only send a warning letter for the first offense. Some YSOs call the parent and youth in for a meeting or the YSO will visit the parents and the youth in the home. Unlike some jurisdictions with curfews, youth are not diverted into counseling or other special programming. The county conducted a large-scale campaign to educate parents and youth about the law's requirements, and the law is simple and straightforward.

Examination of records and discussions with officers revealed that the county is enforcing the basic parts of the curfew ordinance. Two thousand curfew violations were recorded in police records from the beginning of curfew enforcement (July 1, 1996)

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[2] Exceptions to the law include when a juvenile is legally employed and carrying a certified Employment Card or Exception Card; when a juvenile is accompanied by his parent or other authorized adult; and when juvenile is returning home by the most direct route within one hour after the end of an activity.

through March of 1999. The curfew violators were overwhelmingly male (78 percent) and African American (79 percent). Although five percent recorded their residence as the District of Columbia, the majority of curfew violators lived in the police district in Prince George's County where they were charged with a curfew violation. A YSO has the discretion to determine whether to process the curfew violation. For some of the recorded violations, the juveniles simply were warned by the police officer on the street. The monthly range of violations processed across the county generally ran from zero to ten per police district, but there was variation across districts and Youth Services Officers. In the summer months, some police districts processed 20 to 30 curfew violations.

The Interrupted Time Series Intervention Analysis

The objective of the intervention analysis component is to determine whether (1) the number of arrests of youth under 17 and under was reduced after the curfew was introduced and (2) the number of calls for service for disturbances and crimes was reduced after the curfew was implemented. The intervention analysis addresses the following questions:

1) Did the curfew reduce arrests of youth under 17 for property crimes during curfew hours?

2) Did the curfew reduce arrests of youth under 17 for violent crimes during curfew hours?

3) Did the curfew reduce the number of calls for service for disturbance and disorderly conduct calls during curfew hours?

4) If there was a reduction in the number of arrests and/or calls for service involving youth, what was the nature of the effect? Was it gradual or abrupt, temporary or permanent?

5) Were some types of calls for service more affected by the curfew than others?

6) Did curfew implementation cause any temporal displacement, in that crime was moved from curfew hours to non-curfew hours?

The Quasi-Experimental Design

The methods used in this study mirror those used in the victimization study. The most rigorous methodology for the scenario at hand would involve an interrupted time series design with a no-treatment comparison jurisdiction (Cook and Campbell, 1979). However, Prince George's County is different from other jurisdictions in terms of its demographics and crime rates, and is a county, not a city. Washington, D.C., the least dissimilar nearby jurisdiction, intermittently enforced a curfew during a roughly similar period of time. The majority of other jurisdictions in the D.C. metropolitan area have

curfews. Therefore, it would be difficult to find another jurisdiction to serve as an appropriate comparison group. Instead, we have chosen to rely on several comparison groups within Prince George's County that should not be directly affected by the treatment. We make the assumption that the curfew should not directly affect youth over the curfew age, or arrests or calls for service occurring *before* curfew hours.[3] By using persons over curfew age and arrests and calls for service that occur before curfew hours as comparison groups, we eliminate much of the threat of history to internal validity because it is unlikely that a treatment-correlated historical event would apply only to the under 17-year olds.

Measures

The intervention study relies on arrest data and calls for service/computer aided dispatch (CAD) data supplied by the Prince George's County, Maryland's Police Department in Landover, Maryland. We examine arrests of youth ages 12-25 from January 1992 through March 1999, providing 54 months before the intervention and 33 months after the intervention. Arrests are divided into three categories: (1) arrests for violent crimes (homicide, rape, robbery, aggravated assault and simple assault); (2) arrests for property crimes (larceny, burglary and auto theft); (3) arrests for misdemeanor offenses that include drug/narcotics and weapons violations, and disorder-type offenses such as vandalism, disorderly conduct, liquor violations, drunk in public and trespassing. Total number of arrests is also analyzed. The final variables are the number of arrests per 1,000 youth in the respective age group (i.e., 12-16, 17-21, 22-25). The U.S. Census website[4] provided population estimates by age through 1998. Monthly populations by age were then computed from those estimates.

Calls for service (CFS) data were available from 1995 to 1998. According to recent studies, emergency calls for service can provide a reliable measure of time and place variations in crime and crime-related activities (Pierce, et al., 1988; Sherman et al., 1989). CFS are divided into three categories for analysis: (1) calls regarding an alleged violent incident; (2) calls regarding a property incident and (3) calls regarding minor incidents not necessarily related to a violent or property crime incident. These calls included calls regarding someone loitering, or liquor violations, for example. Appendix 1 provides details on how calls were categorized. Because of the enormous volume of CFS each month, the time series was divided into weekly intervals for the analysis. CFS were divided by population (weekly) and multiplied by 100,000.

Table 1 provides an overview of the number of arrests and calls for service in Prince George's County for the time period studied. Given that there are fewer hours that make up "curfew hours" (40 hours out of a 168 hour week); it is no surprise that the number of arrests and calls during non-curfew hours far outnumbers arrests and calls during curfew hours for all crimes and age categories. A disproportionate percentage (88 %) of arrests of youth ages 12-16 occur during non-curfew hours. Over seven times more arrests were made of youth in this age group during non-curfew hours compared to

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[3] It is possible that arrests and calls for service would *increase* during non-curfew hours as a possible result of temporal displacement of crime.

[4] The website can be found at: http://www.census.gov/population/www/estimates/countypop.html

curfew hours. As the age of arrestee increases, the difference between the number of arrests during curfew hours and non-curfew hours decreases. There were 3,255 arrests of youth ages 21-25, and 7,351 arrests of youths in that age group during non-curfew hours—31 percent of arrests during curfew hours compared to 69 percent of arrests during non-curfew hours.

Whereas Table 1 describes the number of arrests and calls over the length of the series, Table 2 provides descriptive information on the dependent variable as calculated for the time series.

Table 1. Arrests and Calls for Service, Curfew and Non Curfew Hours

	Curfew hours	Non-Curfew Hours	Total
Arrests, Jan. 1992 - March 1999			
12 to 16 Year Olds (target group)	3,385	25,072	28,457
Violent Crime	731	5,844	6,575
Property Crime	1,232	9,450	10,682
Misdemeanor Offenses	1422	9778	11,200
17 to 21 Year Olds (comparison)	6,516	18,326	24,842
Violent Crime	2043	4,772	6,815
Property Crime	1,667	6,155	7,822
Misdemeanor Offenses	2,806	7,399	10,205
22 to 25 Year Olds (comparison)	3,255	7,351	10,606
Violent Crime	1,265	2,154	3,419
Property Crime	566	2,444	3,010
Misdemeanor Offenses	1,424	2,753	4177
Calls for Service, 1995 - 1998			
Violent	25,864	77,555	103,419
Property	42,514	293,440	335,954
Disorder	58,466	123,627	182,093
Total Calls for Service	193,227	688,525	881,752

Table 2. Descriptive Statistics for Arrest and Calls for Service Time Series					
Variable	**N**	**Mean**	**Std Dev.**	**Min**	**Max**
Monthly arrests of 12 to 16 year olds, per 1,000					
Total arrests, curfew hrs	87	9.09	4.3	2.68	24.28
Total arrests, non-curfew hrs	87	68.71	13.99	44.87	114.99
Arrest rate for violent crimes, curfew hrs	87	2.01	1.08	0.23	4.82
Arrest rate for violent crimes, non-curfew hrs	87	15.94	4.66	6.4	25.99
Arrest rate for property offenses, curfew hrs	87	3.32	1.83	0.46	9.14
Arrest rate for property offenses, non-curfew hrs	87	25.98	7.43	13.66	46.97
Arrest rate for misdemeanor offenses, curfew hrs	87	3.69	2.28	0.69	12.98
Arrest rate for misdemeanor offenses, non-curfew hrs	87	26.73	6.89	14.62	43.82
Monthly arrests of 17 to 21 year olds, per 1,000					
Total arrests, curfew hrs	87	14.52	3.65	6.95	24.54
Total arrests, non-curfew hrs	87	40.77	5.72	28.23	53.55
Arrest rate for violent crimes, curfew hrs	87	4.55	1.54	1.71	8.48
Arrest rate for violent crimes, non-curfew hrs	87	10.62	1.96	5.67	15.64
Arrest rate for property offenses, curfew hrs	87	3.72	1.61	0.98	7.73
Arrest rate for property offenses, non-curfew hrs	87	13.75	2.86	7.3	21.57
Arrest rate for misdemeanors, curfew hrs	87	6.24	2.25	2.31	12.18
Arrest rate for misdemeanors, non-curfew hrs	87	16.4	5.12	5.22	27.77
Monthly arrests of 22 to 25 year olds, per 1,000					
Total arrests, curfew hrs	87	9.44	2.21	4.26	14.37
Total arrests, non-curfew hrs	87	21.32	3.31	13.77	28.46
Arrest rate for violent crimes, curfew hrs	87	3.67	1.24	1.86	6.72
Arrest rate for violent crimes, non-curfew hrs	87	6.27	1.71	3	12.33
Arrest rate for property offenses, curfew hrs	87	1.62	0.78	0	3.39
Arrest rate for property offenses, non-curfew hrs	87	6.97	2.29	2.8	12.84
Arrest rate for misdemeanors, curfew hrs	87	4.15	1.48	1.37	8.57
Arrest rate for misdemeanors, non-curfew hrs	87	8.08	2.93	3.77	15.75
Weekly Calls for Service per 100,000					
Total calls for service, curfew hrs	209	124.35	24.70	59.20	187.00
Total calls for service, non-curfew hrs	209	443.56	46.28	212.40	541.30
Call for violent incidents, curfew hrs	209	16.64	3.67	5.60	26.50
Calls for violent incidents, non-curfew hrs	209	49.95	5.77	20.00	63.20
Calls for property crime incidents, curfew hrs	209	27.36	4.83	14.00	44.20
Calls for property crime incidents, non-curfew hrs	209	188.96	17.22	104.20	225.90
Calls for disorder incidents, curfew hrs	209	37.58	10.72	9.90	61.80
Calls for disorder incidents, non-curfew hrs	209	79.60	13.67	28.60	108.30

Evaluation Design

For the arrest analysis, the general hypothesis tested is that arrests of youth under 17 years of age during curfew hours will be lower in the period after enforcement of the curfew began compared to the period before the curfew. This time series model, in its simplest form, can be diagrammed as:

O_{A1}	O_{A2}	O_{A3}	O_{A4}	O_{A5}	X	O_{A6}	O_{A7}	O_{A8}	O_{A9}	O_{A10}	
	O_{B1}	O_{B2}	O_{B3}	O_{B4}	O_{B5}		O_{B6}	O_{B7}	O_{B8}	O_{B9}	O_{B10}
O_{C1}	O_{C2}	O_{C3}	O_{C4}	O_{C5}		O_{C6}	O_{C7}	O_{C8}	O_{C9}	O_{C10}	
O_{D1}	O_{D2}	O_{D3}	O_{D4}	O_{D5}		O_{D6}	O_{D7}	O_{D8}	O_{D9}	O_{D10}	
O_{E1}	O_{E2}	O_{E3}	O_{E4}	O_{E5}		O_{E6}	O_{E7}	O_{E8}	O_{E9}	O_{E10}	
O_{F1}	O_{F2}	O_{F3}	O_{F4}	O_{F5}		O_{F6}	O_{F7}	O_{F8}	O_{F9}	O_{F10}	

where A is the outcome variable: arrests of youth within curfew age (under 17) during curfew hours. B and C are arrests of individuals over the curfew age during curfew hours (B is 17-25 year olds and C is 26 year olds and up). D, E and F represent arrests outside of curfew hours (D is youth within curfew age, E is 17-25 year olds and F is arrests of those older than 25). We hypothesize that Series B and C will show no effects although some might say that any increased police presence could lead to a reduction in arrests overall (for any ages). Series D—arrests of youth under 17 outside of curfew hours--may increase because of temporal displacement effects, and Series E and F should show no positive or negative curfew effects.

For the calls for service analysis, the same basic design is used as described above, with the exception that official data on calls for service cannot recognize the age of the offender perpetrating the crime or disturbance that led to an individual making the 911 call. Because we cannot assess the age of the offender, it is not possible to utilize different age groups as comparison groups. For the calls for service intervention analysis, the main comparison group will be calls for service during non-curfew hours. We hypothesize that calls for service for incidents most likely to involve youth will decrease during curfew hours after the implementation of the curfew.

The effect of the curfew law (i.e., the intervention) was analyzed using a dummy variable coded 0 before July 1, 1996 and coded as 1 otherwise. Based on conversations with police personnel, the authors expected to find that the law had an immediate and permanent, as opposed to gradual but permanent, effect on arrests and calls for service when the county began enforcement of the law. Police officers and county officials felt that their widespread efforts to inform parents and youth about the revised curfew would be sufficient to create an immediate effect when enforcement began. Although the law was passed in November 1995, the specification of the model is based on when enforcement began, not on the date of the passage of the law, because no action was taken to introduce the law, or enforce it, until July 1, 1996. A brochure explaining the curfew was sent with June report cards to all county students in the eighth through tenth grade.

The study uses a combination of standard OLS regression analysis and autoregressive integrated moving average (ARIMA) techniques to assess the impact of the curfew on arrests and CFS in Prince George's County. For the majority of the series, OLS regression was not appropriate because the series revealed autocorrelation. Some time series did not reveal autocorrelation, indicating different processes operating across series types.[5] SAS and SAS/ETS software was used for modeling. ARIMA techniques[6] involve transforming the dependent series into a new set of observations that are distributed independently and normally with a mean of 0 and a constant variance. This is known as "pre-whitening." After the series is pre-whitened, a transfer function is used to estimate the impact of the intervention on the pre-whitened dependent series. The resulting model is subjected to diagnostic tests to determine if the model is adequate. If the model is not adequate, a new model is estimated until a statistically adequate model is found. The transfer functions considered for this study are (1) an abrupt and permanent decrease in the rate of arrests and calls for service (zero-order transfer function), (2) a gradual and permanent decrease (first-order transfer function), and (3) an abrupt, but temporary decrease, where the rate of arrest and calls for service returns to preexisting levels as time passes (pulse function). The authors hypothesized that any impact of the curfew will be abrupt (or immediate) and permanent. Regardless, the three transfer functions were tested to determine which model provided the best fit for the data. The appropriateness of the intervention component was examined using the CROSSCOR option of the IDENTITY statement in PROC ARIMA of SAS. After examining bounds of stability and Residual Mean Square (RMS) statistic, it was determined that the zero-order transfer function model had the best fit.[7]

ARIMA analysis permits seasonal processes to be modeled, which is important for time series that exhibit seasonal fluctuations. Past studies have shown that crime may have seasonal cycles as fewer crimes tend to be reported to the police and self-reported in the winter months, particularly in parts of the country that have cold winters. It is anticipated that the monthly arrest series and weekly calls series will exhibit seasonal fluctuations.

Findings

Arrests

A visual examination of the plot of total arrests during curfew hours for 12 to 16 year olds (Figure 1) reveals no clear evidence of an impact of curfew implementation in July 1996. It is noticeable that arrests spike every July, but the spike was not quite as

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[5] PROC REG was used in cases where there was no evidence of autocorrelation. There were five series where PROC REG was used: non-curfew arrests of 17 to 21 year olds for violent crimes; curfew arrests of 22 to 25 year olds for violent crimes; curfew arrests and non-curfew arrests of 17 to 21 year olds for property crimes, and curfew arrests of 22 to 25 year olds for misdemeanors.

[6] The functional form of ARIMA models is (p,d,q)(P,D,Q)s where: p is the autoregressive parameters in the model; d is the number of regular differences taken to make the mean of the series statistically equivalent across its time domain; q is the number of moving average parameters; P is the number of seasonal autoregressive parameters; D is the number of seasonal differences taken; Q is the number of seasonal moving average parameters; and s is the seasonal period modeled.

[7] Given the large number of series examined, the resulting statistics for these tests are not included here.

large in July 1996 as in July months in preceding years. Also, across the entire time series, curfew arrests reach an all time low in March of 1997 (3.46 per 1,000 arrests), after the curfew was implemented. However, these changes are most likely due to the fact that arrests of youth decreased steadily in the mid-1990s for the majority of large jurisdictions (Blumstein and Wallman, 2001). Figure 2 shows the curfew hour time series for calls for service. Curfew implementation was at Week 79 in the calls for service series. Visual examination of weekly calls for service reveals no evidence of any impact.

The results of the ARIMA model of arrests and calls for service estimated for the full time series with the intervention (curfew implementation) included are reported in Table 3 and Table 4. The tables show the parameter estimates for the intervention and the associated standard errors achieved by estimating a zero-order transfer function intervention model. This model tests whether curfew enforcement produced a significant abrupt and permanent reduction in arrests and calls for service. The results of the arrest analysis (Table 3) show that curfew hour total arrests of 12 to 16 year olds decreased by just over 1 per 1,000 youth per month after the curfew was implemented. Although the effect was in the predicted direction, the effect was not significant. However, when total arrests are disaggregated by crime type, there is significant decrease in both curfew arrests for violent crimes and property crimes. Arrests for misdemeanor crimes decreased in both curfew hours and non-curfew hours, but the coefficients were not significantly different from zero. The results indicate that curfew arrests of 12 to 16 year olds for violent crime decreased on average by 0.4 per 1,000 each month after the curfew was implemented. Reduction in arrests for property crimes for this age group during curfew hours was greater at roughly 1 per 1,000 youth. These results might suggest that the curfew succeeded in reducing arrests, but the results from the comparison series (i.e., non-curfew arrests) also show that arrests during *non-curfew* hours also decreased significantly. Looking at differences between curfew hour arrests and non-curfew hour arrests for the 12 to 16 year olds, there were no instances where arrests during curfew hours decreased significantly compared to arrests during non-curfew hours. This finding provides some indication that the curfew was probably not responsible for the reduction in youth arrests during curfew hours. Even if the curfew was responsible for the reductions found, the reduction of anywhere from 0.2 to 1.2 curfew arrests per month per 1,000 youth is a very small reduction in arrests when spread across the entire county.

What is interesting are the findings from the other comparison series for arrests of youth ages 17 to 21 and 22 to 25. Table 3 also shows that arrests increased significantly in a number of crime categories for older youth and young adults. The arrest rate for violent offenses and property offenses in non-curfew hours increased significantly for the 17 to 21 year olds at the same time that arrests for these offenses decreased during curfew hours, though not significantly. This is the effect we predicted we would find for the curfew age youth—not youth who are *not targeted for intervention* under the curfew law (although the decrease in curfew hour crime for the 17 to 21 year olds is not significant, and hence, may be explained by chance). Perhaps one could attribute the reduction in arrests after July 1996 for curfew age youth to the beginning in Prince George's County of the overall trend in reductions in crime that the nation was experiencing in the late 1990s. However, as demonstrated by the 17 to 21 year old arrest time series, the comparison series did not follow a reduction in arrests. Similarly, with the exception of property crime arrests, arrests *increased* for violent and misdemeanor crimes for 22 to 25

years olds—both during curfew hours an non-curfew hours (though the increase was not a significant increase for curfew hour arrests in these crime categories).

Calls for Service

The results of the ARIMA intervention models of calls for service (Table 4) shows that none of the parameters for the curfew hour age groups are significant, although they are in the expected direction. However, both calls for service during curfew hours and during non-curfew hours decreased, further providing evidence that there was no effect of the curfew on calls for service.

This study also examined the clustering of calls for service during curfew hours in order to detect any changes in the location and concentration of calls after the curfew was implemented. The following sections of the report discuss the results of the spatial analysis. At the close of the spatial analysis sections, a summary and overall conclusion for this study are provided.

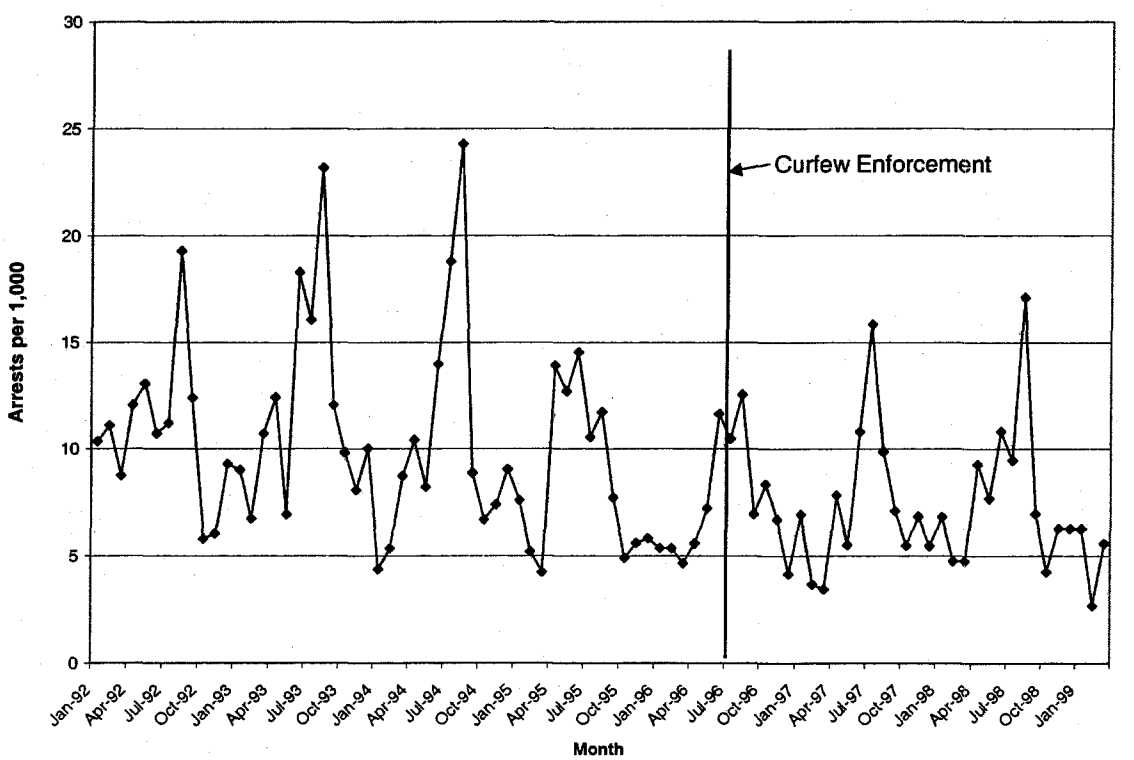


Figure 1. Time Series of Curfew Hour Arrests, Youth 12-16 Years Old, January 1992 Through March 2000

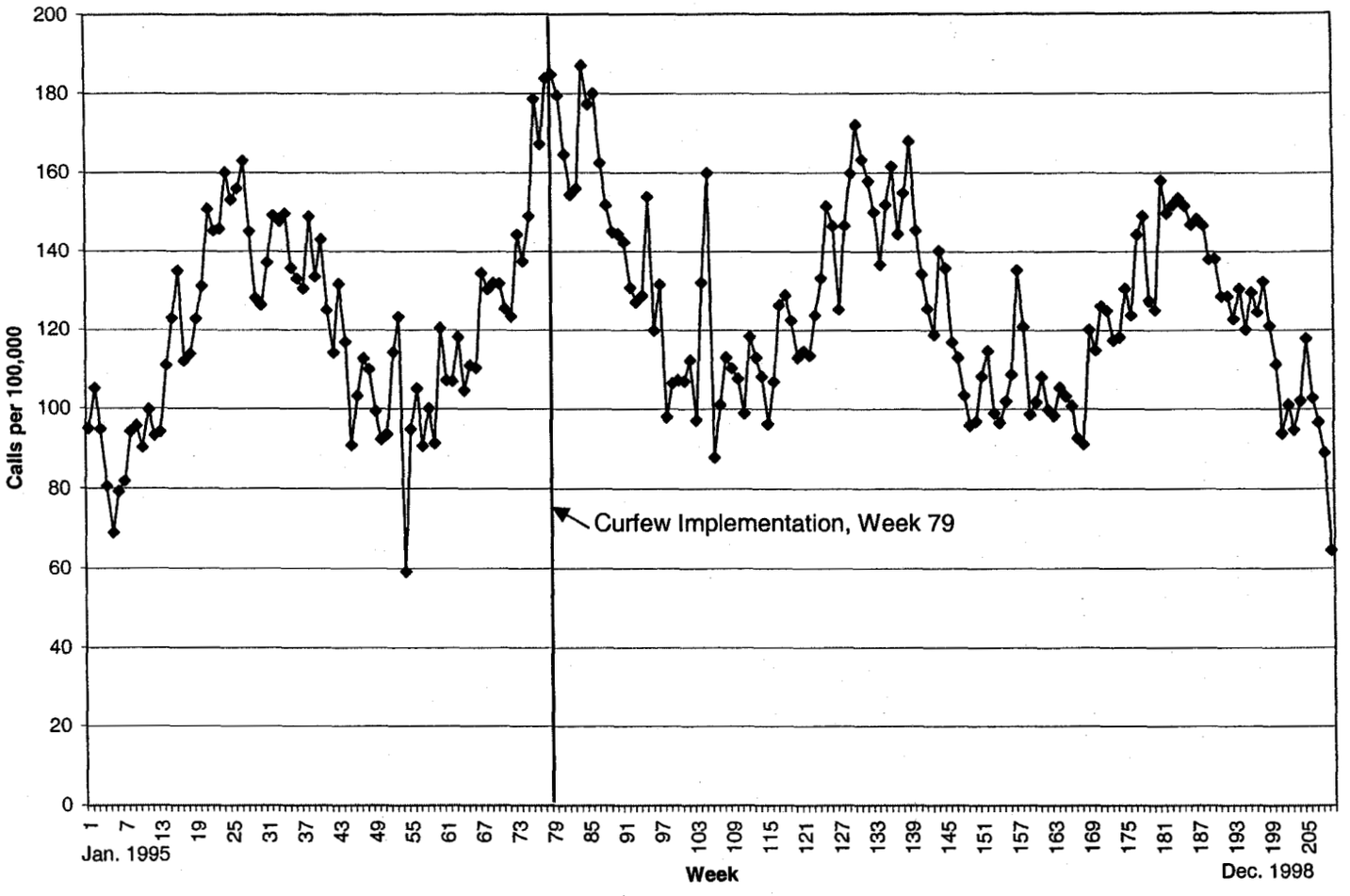


Figure 2. Time Series of Total Curfew Hour Calls for Service, January 1995 through December 1998

Table 3. Intervention Estimates for Effect of Curfew on Monthly Arrests, Prince George's County, Maryland, 1992 to 1999

Variable	Intervention Parameter	Standard Error
Monthly arrests of 12 to 16 year olds, per 1,000		
Total arrests, curfew hrs	-1.21	1.24
Total arrests, non-curfew hrs	-12.47**	4.31
Arrest rate for violent crimes, curfew hrs	-0.44*	0.27
Arrest rate for violent crimes, non-curfew hrs	-2.31*	1.56
Arrest rate for property offenses, curfew hrs	-1.03**	0.56
Arrest rate for property offenses, non-curfew hrs	-8.90***	2.04
Arrest rate for misdemeanor offenses, curfew hrs	-0.24	0.78
Arrest rate for misdemeanor offenses, non-curfew hrs	-0.97	1.97
Monthly arrests of 17 to 21 year olds, per 1,000		
Total arrests, curfew hrs	1.05	1.17
Total arrests, non-curfew hrs	0.78	0.91
Arrest rate for violent crimes, curfew hrs	-0.21	0.44
Arrest rate for violent crimes, non-curfew hrs	1.04**	0.45
Arrest rate for property offenses, curfew hrs	-0.40	0.40
Arrest rate for property offenses, non-curfew hrs	1.59**	0.95
Arrest rate for misdemeanors, curfew hrs	1.66**	0.67
Arrest rate for misdemeanors, non-curfew hrs	6.16***	1.44
Monthly arrests of 22 to 25 year olds, per 1,000		
Total arrests, curfew hrs	0.50	0.57
Total arrests, non-curfew hrs	2.08**	0.83
Arrest rate for violent crimes, curfew hrs	0.28	0.31
Arrest rate for violent crimes, non-curfew hrs	1.10***	0.38
Arrest rate for property offenses, curfew hrs	-0.25	0.28
Arrest rate for property offenses, non-curfew hrs	-0.03	0.22
Arrest rate for misdemeanors, curfew hrs	0.62	0.58
Arrest rate for misdemeanors, non-curfew hrs	3.82***	0.74

*p <.10; **p < .05; p<.001

Table 4. Intervention Estimates for Effect of Curfew on Weekly Calls for Service, Prince George's County, Maryland, 1995 to 1998

Variable	Intervention Parameter	Standard Error
Weekly Calls for Service per 100,000		
Total calls for service, curfew hrs	-1.26	1.23
Total calls for service, non-curfew hrs	-3.47	2.54
Call for violent incidents, curfew hrs	-0.18	0.23
Calls for violent incidents, non-curfew hrs	-0.28	0.37
Calls for property crime incidents, curfew hrs	-0.15	0.30
Calls for property crime incidents, non-curfew hrs	-0.89	1.18
Calls for disorder incidents, curfew hrs	-0.30	0.56
Calls for disorder incidents, non-curfew hrs	-0.64	0.73

*p <.10; **p < .05; p<.001

The Spatial Analysis

The objective of the spatial analysis is to examine whether the curfew changed the spatial patterning of calls for service after the curfew in areas of high crime concentration. This analysis will answer the following questions:

1. Was crime clustering in hotspot areas during curfew hours reduced after the curfew began?
2. Did any hotspot areas completely disappear after the curfew was implemented?
3. Were new hotspot areas created after the curfew began?
4. If a reduction or elimination of hotspot areas occurred, did it last?
5. Was there any evidence of spatial displacement?

The design is based on the utilization of a geographic information system (GIS) to plot the spatial location of the calls for service. Because the curfew is specifically designed to stop behaviors (i.e. loitering or hanging out in groups in public spaces) that may give rise to chronic crime problems (Skogan, 1990), this research hypothesized that if the curfew has been implemented so as to maximize its crime control impact, patterns of calls for service would change more extensively in high crime areas than elsewhere after the curfew is implemented. The methods used to analyze changes in spatial clustering, described below, are exploratory methods that can show changes in clustering as well as assist in developing hypotheses regarding criminal behavior during curfew hours. The techniques used here are limited in their methodological rigor in that the methods applied cannot determine with any certainty that changes were due to curfew implementation. Modeling changes in spatial clustering across the entire county would involve complex spatial statistical modeling beyond the scope of this study.

Spatial Analytic Methods

The Record Management System for calls for service in Prince George's County combines calls into one record if the calls take place close in time and the determination of the same event can be easily discerned. Three types of calls were examined: calls relating to violent incidents, calls relating to property incidents, and calls that could be categorized as disorderly conduct (see Appendix A for more detail). Only calls for service *during* curfew hours were analyzed to determine if spatial changes occurred across the county. Spatial changes that involve reductions in hotspots with new hotspots emerging nearby would signify spatial displacement. Temporal displacement—changes in the times that calls occurred—was not examined in this study.

High concentration areas were identified using two methods: (1) the nearest neighbor clustering technique of the CrimeStat program (Levine, 1999) and (2) kernel estimation (Silverman, 1986; see McLafferty, Williamson and McGuire (2000) for discussion of using kernel smoothing for identifying crime hot spots). Nearest neighbor clustering is a hierarchical technique that begins by grouping points based on the next closest point (nearest neighbor). This technique generates ellipses around clusters of

calls; the user specifies the probability level for the random expected nearest neighbor, the minimum number of calls to form an ellipse and the number of standard deviations for determining the size of the ellipse. This study uses one standard deviation ellipses with 90 percent confidence that the clustering is spatially closer than would have happened by chance if the calls were spread evenly over the county. A number was set as the minimum number of calls after preliminary examination of the data. The study analyzed yearly changes in clusters, monthly changes, and changes for six-month periods. Yearly clusters are examined to establish, with a very large sample size, a baseline for understanding where clusters are in the county, and determine the stability of the clusters over time. Monthly and six-month clusters are examined for periods before the curfew and after the curfew was implemented to determine whether changes occurred that may be due to the curfew.

Kernel estimation is a relatively new spatial technique to display and identify hot spot areas. Kernel estimation involves creating a smooth surface that represents variation in density of events over space. Similar to nearest neighbor analysis, it is a point based method, but it differs from nearest neighbor analysis in that the densities created represent a continuous variable of different densities. Peaks and valleys represent areas of high crime and low crime, respectively. The density at each location does not simply reflect the count of points at that particular location (as did the preceding analysis), but also reflects the concentration of points in the surrounding area (spatial configuration). Calculation of kernel density begins by laying a fine grid across the geographical area being studied. Distances from the center of the grid cell to each observation that falls within a pre-defined bandwidth are measured. The bandwidth defines the radius of a circle centered on a grid point location. The user determines the size of the grid cells and the bandwidth.

Kernel estimation has advantages to cluster analyses because kernel estimation can capture irregularly shaped areas (and hence, irregularly shaped hot spots), which nearest neighbor analysis cannot. Kernel estimation also avoids some of the subjectivity involved in defining hot spots that occurs with nearest neighbor analysis. However, because the user does choose the grid cell size and bandwidth, some subjectivity is involved with kernel estimation. For this study, a grid cell size of 100 feet is used and bandwidth of 0.75 miles.

Findings

Figure 3 shows a map of the entire county, which is divided into six police districts. The smaller gray lines represent the police beats within the districts. Calls for service are concentrated within the three police districts (I, III, and IV) that border the District of Columbia. The hotspots that are identified in this analysis are all located within these districts.[8] *All the maps (Figures 3 through 7) can be found at the end of the report, preceding the references.*

[8] The clustering method used does not take into account the population of the area.

Yearly Patterns

Table 5 displays the number of calls analyzed each year in the different categories, the number of clusters found, and the number of call incidents that are represented by the significant clustering. The raw number of calls for service for each year within the three categories remained fairly stable, exhibiting a slight downward trend in numbers of call incidents from 1995-1998. With the exception of the property category, the numbers of clusters and the percent of the total number of incidents that the clusters accounted for varied only slightly. Property offenses showed a substantial change in both the numbers of yearly clusters (from a high of 5 in 1995 to only 1 in 1998) and correspondingly, the percentage of the total number of incidents that the cluster(s) represent.

Establishing that both the numbers of calls for service and the clustering of calls for service remained stable over the four years for violence related calls and disorder related calls, and declined somewhat for property related calls, the analysis moved to visual examination of clusters within six-month periods. Because the curfew was implemented mid-year (July 1996), examination of six-month aggregate clusters provides a more accurate picture of any changes that occurred after the curfew was implemented. Maps are provided for six-month patterns (Figure 4-6).

Table 5. Descriptive Information for Yearly Clusters of Calls for Service

Category/Year	Sample Size	Cluster Criteria	Number of Clusters	Percentage of Total Number of Incidents
Disorder				
1995	15,003	150	4	6%
1996	14,421	150	4	6%
1997	13,896	150	4	6%
1998	13,858	150	4	7%
Property				
1995	10,652	75	4	4%
1996	10,520	75	5	5%
1997	9,140	75	2	2%
1998	8,756	75	1	1%
Violent				
1995	6,447	75	4	7%
1996	6,581	75	6	9%
1997	5,970	75	4	6%
1998	6,056	75	4	7%

Six-Month Patterns

Calls for Service for Violent Incidents

The nearest neighbor cluster criteria (i.e., the minimum number of calls to form a cluster) was set at 50 incidents for the violence-related six-month clusters of calls for service. There are three clusters within the pre-implementation period and six clusters in the post-implementation period. Three of the post-implementation clusters appeared in almost the identical locations (northwest location) as the clusters before curfew implementation (Figure 4).

The increase in the number of clusters could be caused by an increase in calls for service in District IV and the lower half of the District III after curfew implementation. Indeed, the overall number of calls for service for incidents of violence increased from 3,076 in the former period to 3,505 in the latter. However, the number of calls represented by each cluster decreased from the pre-period to the post-period. Although only three clusters emerged pre-curfew, the numbers of incidents in each cluster range from a low of 76 to a high of 97. In the corresponding post-curfew clusters, these clusters ranged from a low of 63 incidents to a high of 78 incidents per cluster. The remaining three post only clusters were composed of only 54 to 59 incidents per cluster. Essentially, among the three reappearing clusters, the density of the pre-curfew clusters was greater than the density of the post-curfew clusters. A decrease in density of hotspots post implementation coupled with the emergence of new (not previously existing) hotspots could indicate some degree of spatial displacement that was caused by the curfew. However, because the curfew was not geographically targeted to a particular area, it is difficult to scientifically confirm that spatial displacement occurred primarily because of the curfew.

Calls for Service for Property Incidents

Similar to cluster patterns for violent incidents, there are three pre-curfew clusters and five post-curfew property crime call incident clusters, using a cluster criteria of 50 calls per cluster (See Figure 5). The three pre-curfew clusters overlap with three post-curfew clusters, while the remaining two clusters are post-curfew only. The three pre and post clusters are located in similar locations to the violent incident calls for service.

The overall six-month raw numbers on calls for service for property related incidents were higher post-curfew than they were pre-curfew, from 4998 to 5522 calls. All of the clusters range between 53 and 69 incidents per cluster except for one dense cluster post-curfew. This cluster contains 66 incidents pre-curfew and 84 incidents post curfew. The remaining two pre-post clusters both reduced in incident-per-cluster size, from 69 to 55 incidents in one cluster and 61 to 53 incidents in the other cluster.

Calls for Service for Disorder Incidents

The minimum criteria for clustering was set to 85 calls. Both the pre-curfew period and pos-curfew period reveal six clusters. There are two pre-clusters that did not have a corresponding post cluster (Figure 6), indicating some reduction in clustering in those areas. However, since two new clusters emerged after the curfew was implemented, no conclusion regarding the curfew can be drawn, with the exception of stating that .

However, it is important to note that one of these pre-clusters had a post cluster for property crime calls and violent crime calls.

Monthly patterns

The examination of monthly patterns, the smallest data period that we examined, allows us to account for seasonal variation, and allows for analysis of short-term curfew implementation changes. The fairly stable yearly cluster patterns, and even the six-month clusters, can mask month-to-month variation. Because graphic presentation of maps involving a large number of months is cumbersome, in that many maps are needed to demonstrate patterns, no maps for this section are provided.

Pre and Post Curfew, Monthly, Calls Related to Violent Incidents

This analysis examined monthly clusters of calls just prior to and after curfew implementation, specifically, June-September 1996 (the curfew was implemented July 1). Table 6 shows the descriptive statistics on the clusters. There were 665 violent calls for service during curfew hours in the month of June. These incidents formed nine clusters in June, based on a 15-incident-per-cluster criteria. Although the total number of calls increased in the month of July (694), fewer clusters formed as a result of these incidents. Only six clusters appeared in July, every one on or near a similar cluster from the month of June. There was no evidence of three clusters in July. However, after July, additional clusters appeared. The number of incidents decreased slightly again in August (683), but the number of clusters rose, to a total of nine clusters. Three of these clusters did not appear in either June or July. In September, the number of incidents dropped to 626. Only five clusters emerged in September; only one cluster was new, and this new cluster appeared in the vicinity of the University of Maryland. This isn't surprising considering that the area sees an influx of thousands of students in September each year.

Table 6. Descriptive Information for Monthly Calls for Service-Violence

Month	Sample Size	Cluster Criteria	Number of Clusters
June 1996	665	15	6
July 1996	694	15	6
August 1996	683	15	9
September 1996	626	15	5

After the examination of calls for service clusters for violent incidents from June to September of 1996, we expanded the analysis to include all months from 1996 to 1998. No particular patterns of clusters emerged from this analysis (no maps shown).

Pre and Post Curfew, Monthly, Calls Related to Property Incidents

There were 1003 property incident calls for service during curfew hours in the month of June 1996 (see Table 7). These incidents formed six clusters, based on a 15-incident-per-cluster criteria. From June to July 1996, both the number of incidents (1047) and number of clusters (7) increased slightly. Six of the seven clusters also appeared in the preceding month. No clusters disappeared from June to July and one new cluster appeared in the month of July. This slight increase in clusters continued into August, when there were 1081 incidents and nine clusters. Again, six of the clusters appeared in both of the previous months, with the addition of three new clusters, all located in the District IV. The numbers began to recede in September, with 950 incidents and only 6 clusters. In September, a few of the usual suspects disappeared; only three of the six clusters appeared in previous months. In general, June, July, and August were the hottest per-incident months for property offenses, with very few exceptions. These findings reveal no evidence that the curfew impacted property incident clusters.

Table 7. Descriptive Information for Monthly Calls for Service-Property

Month	Sample Size	Cluster Criteria	Number of Clusters
June 1996	1003	15	6
July 1996	1047	15	7
August 1996	1081	15	9
September 1996	950	15	6

Pre and Post Curfew, Monthly, Calls Related to Disorder

There was great variation in the number of disorderly incidents per month, from a low of about 700 in the winter months to highs around 1,600 in the summer months. Maintaining a 20 incidents per cluster criteria yielded numbers of clusters ranging from two to three per month to 16 per month. The hottest disorder related call months was generally June, July, and August.

Clusters were relatively stable before and after the curfew was implemented. In June 1996, there were 13 clusters, July had 14 clusters and August had 13 clusters. September, however showed a decrease in both the number of calls and number of clusters (10 clusters found). The analysis found some evidence that locations of clusters changed, but a similar pattern was found upon examination of monthly clusters in other years. The density of calls per cluster fluctuated, but no clear patterns emerged.

Table 8. Descriptive Information for Monthly Calls for Service-Disorder		
Month	**Cluster Criteria**	**Number of Clusters**
June 1996	20	13
July 1996	20	14
August 1996	20	13
September 1996	20	10

Kernel Density Estimation

The final part of the spatial analyses utilized the statistical method known as kernel estimation to identify hot spots.

Curfew-hour calls for service density surfaces were created with Spatial Analyst using the aggregated point patterns of calls for service from July 1995-June 1996 (pre-curfew enforcement) and the aggregated point patterns from July 1996-June 1997 (post-curfew enforcement). Full year aggregated data pre- and post-curfew is used to achieve a meaningful density estimate, accounting for a full range of months for each period. To examine change, the post-curfew density map is computed using the same ranges of density scores that are found for the pre-curfew period. Then, the change in density calculation is performed using the Spatial Analyst map calculator; the post curfew kernel density is subtracted from the pre-curfew kernel density and then collapsed into time periods and plotted on the map. The results indicated that of the three crime types, only property calls exhibited a noticeable difference in density post curfew (Only the property crime maps are shown). The map is presented in graduated shades; the deeper red represents the highest increase from time one to time two and the darkest blue represents the highest decrease in density. For all three crime types, the kernel density estimation revealed hot spots in the same areas as those found using the nearest neighbor method.

Calls Related to Violent Incidents

Kernel density estimation revealed similar concentration as those found using nearest neighbor methods shown in Figure 4. The density change map (not shown) revealed that there were many areas that decreased in density of calls and many areas that increased in density. No discernable patterns were found.

Calls Related to Property Incidents

Panel 1 of Figure 6 shows that the majority of high concentration areas were found in District III and IV pre-curfew and post-curfew. Comparing pre to post, it appears that the area of concentration of property crime calls is much smaller and density

has decreased for the post-curfew period. The final panel of Figure 6 reveals large areas that experienced a decrease in density. From this examination, it appears that the curfew was associated with a decrease in the density of property incidents. These findings are in contrast to those findings from the nearest neighbor analysis examining six-month clusters (which found an increase in the *number* clusters). However, the monthly analysis found a general pattern of a decreasing number of clusters after the curfew.

Calls Related to Disorder Incidents

The density change map (not shown) presents a picture of almost equal parts increase and decrease areas across the county, indicating no discernable pattern that could be attributed to the curfew. This result mirrors the nearest neighbor analysis of six-month patterns, which revealed the same number of clusters post-curfew as pre-curfew.

Summary of Spatial Analysis

With regard to the point distribution of calls, we examined the distribution of calls from several vantage points: six-month intervals pre- and post-curfew, consecutive months and the same months each year. Using nearest neighbor analysis, six-month pre- and post curfew results display a substantial increase in the raw number of calls for each category from pre-curfew months to post-curfew months (June through August 1996), with a decrease in the number of calls in September. Because the summer months usually see increases in crime, it is difficult to determine through exploratory analysis examining months, whether changes occurred due to the curfew. Six-month patterns could provide a more appropriate examination of changes. Although a targeted intervention should reduce crime and/or crime concentration, six-month clustering shows that the number of clusters increased for violence-related calls and property-related calls. The number of disorder clusters remained the same post-curfew, but the locations of two clusters moved (or two clusters disappeared and two new ones emerged). Overall, there is no visual evidence from the nearest neighbor analysis that clustering was impacted by the curfew.

The kernel density analysis provided some evidence that the concentration of property related calls decreased after the curfew was implemented. There is no hard evidence that patterns of concentration of violent crime calls and disorder calls changed due to curfew implementation. Some dense locations evidenced less dense concentrations after the curfew, but no strong patterns emerged.

Discussion

The Interrupted Time Series

The time series analysis revealed there was little support for the hypothesis that the Prince George's County curfew reduced arrests and calls for service during curfew hours. With regard to arrests, any significant decreases in curfew hour arrests of targeted youth (12 to 16 years old) was mirrored by significant decreases in the comparison group (non-curfew hour arrests). It is difficult to imagine that there was *temporal* spillover of curfew effects into non-curfew time periods. In other words, there are no plausible

explanations related to curfew enforcement that would explain why the curfew had an impact on non-curfew arrests. Unless one could imagine that news of the curfew implementation caused youth between the ages of 12 and 16 to be on their best behavior at all times. It is interesting that arrests decreased for curfew age youth across all crime types and time periods, but in general, arrests *increased* for the older age groups. This may be somewhat encouraging for curfew advocates.

On the other hand, the results of the calls for service interrupted time series analysis were not encouraging. Although calls decreased after curfew implementation, the decreases were not significant, and there were also decreases in non-curfew hour calls for service.

Information collected from interviews with Youth Service Officers can shed some light on why effects of the curfew were not found. The officers revealed that each police district acts independently with regard to curfew enforcement. There is no central authority within the police department that oversees the responsibilities of each Youth Services Officer (YSO). Hence, there is much variation in the level of effort YSOs place on creating curfew awareness and processing violations. Some YSOs take it upon themselves to inform new officers about the curfew and remind students periodically by visiting classrooms or sending flyers to the schools with the COPS officers. Almost all of YSOs that were interviewed have been in their position less than two years.

The Spatial Analysis

Regarding the spatial analysis, it is difficult to draw any direct conclusions regarding the influence of the curfew. To determine if crime clustering in hotspot areas during curfew hours reduced after the curfew began, the authors examined monthly and biannual maps. These maps did not display any discernible changes that reflected hypothesized impacts of the curfew. To the contrary, the spatial patterns seemed to indicate an increase in the number of clusters after the curfew was implemented.

The spatial analyses also examined whether any hotspots totally disappeared. Six-month clustering patterns revealed through nearest neighbor analysis showed that only for calls for service for disorder incidents did clusters disappear (two disappeared). However, two new clusters in different areas emerged in the post-curfew time period. Also disheartening is that one of the two clusters that seemed to disappear actually appeared as a violent and property crime incident cluster in the post-curfew period.

The only encouraging results regarding the spatial analysis are found examining the kernel density estimation for property crime densities (Figure 7). The density map post-curfew shows many areas much less dense than they were before the curfew was implemented. However, the change in density map (panel 3 of Figure 7) show that there are many areas that increased in density.

In general, examining the spatial dynamics of calls for service for an entire county gives us the big picture of crime and disorder. We attempted to detect patterns and provide explanation for any changes found. This type of exploratory analysis can answer *what* is happening with regard to crime, *where* is it happening, and *when* is it happening, but we cannot determine *who* and *why* with the available data and methodology employed. Exploratory nature of this kind should be used as a platform, from which

researchers can begin to target smaller geographic areas or micro-locations (such as police beats or small neighborhoods), as well as adding other layers to the geographic information system. Other important data to add insight to spatial patterns includes social and economic indicators, land use, and types of institutions and establishments. Detailed examination of micro-locations can be utilized to inform CPTED (crime prevention through environmental design), and other situational crime prevention programs.

Exploratory data analysis can also include other methods such as examination of spatial autocorrelation to locate hot and cold crime areas. This type of exploratory data analysis provides information on areas that are outliers—either high crime areas located within low crime areas or low crime areas surrounded by high crime areas. A close examination of the socio-economic correlates in these outlier areas can provide hypotheses that address the causes of crime and, in turn, inform, crime prevention solutions.

Additional research that was not part of the scope of this study can include examination of the interaction of the different crime indicators. For instance, do calls for service correlate with police arrests? If not, why not? Are police responding to calls differently in different geographic areas? Are calls weighted for importance and do police coverage and weight affect the response to calls? Do certain areas produce more calls than other areas and if so, do they get more or less police attention?

Conclusion

This study set out to provide a rigorous assessment of the impact of a county's revised curfew law. Prince George's County Police Department has a comprehensive incident-based computer system and supportive officers that made a detailed and thorough evaluation of one jurisdiction's curfew policy possible. Recent curfew evaluations that used aggregate data and compared across cities and counties had suggested that future research focus more specifically on individual jurisdictions. Prince George's County's curfew law specifies that youth under the age of 17 must be off the streets at 10 p.m. on week nights and midnight on weekends. Violations are considered civil offenses, not criminal, and penalties for violation are fines, directed to the parents or guardian. The county provides no special youth programming or counseling for youth or families in violation. Essentially, the county's curfew policy does not seem to involve a very large expenditure in time or dollars.

While the findings do not provide overwhelming evidence either in support of or against the curfew, arrests of curfew age youth did decrease after the curfew was implemented, while arrests of older youth increased in most crime categories. Regardless of these differences, it cannot be concluded with certainly that the curfew reduced juvenile arrests. Even if the results showed an impact, an obvious limitation to this study is that generalizability is limited to jurisdictions that are similar to Prince George's and/or have similar curfew regulations. Another limitation in this study, as well as the other studies on curfews, is that the research does not take into account what youth programming or other events are happening in the community that may have produced the decrease in arrests of youth ages 12 to 16 after curfew enforcement began.

Interviews with officers revealed that curfew enforcement and processing was not a priority in recent years, and the level of effort made to create awareness and process violations greatly varies across police districts. Beat officers spend the overwhelming majority of their time responding to 911 calls. It is up to the Youth Services Officer, who is in charge of processing curfew violations, to make youth and parents aware of the curfew. Perhaps steady and consistent enforcement and processing of curfews across all police districts would have contributed to a noticeable reduction in arrests. However, given the limited resources that law enforcement agencies often have, greater curfew enforcement may not have been an option. Future research on the impact of curfews should include times series measures of resource allocation, enforcement and arrest, as well as contain adequate measures that control for events that are happening in the community.

With the increasing number of police departments computerizing incident-based data that includes the age of the arrestee, victim, location of incident, and time of day of incident, micro-level research of program impacts on crime has great potential in terms of improving quasi-experimental designs. Continuing to explore the spatial dimensions of youth crime using new methods and technology will generate new and valuable insights to the context of crime and disorder over time and space.

Figure 3. Prince George's County, Maryland Police Districts

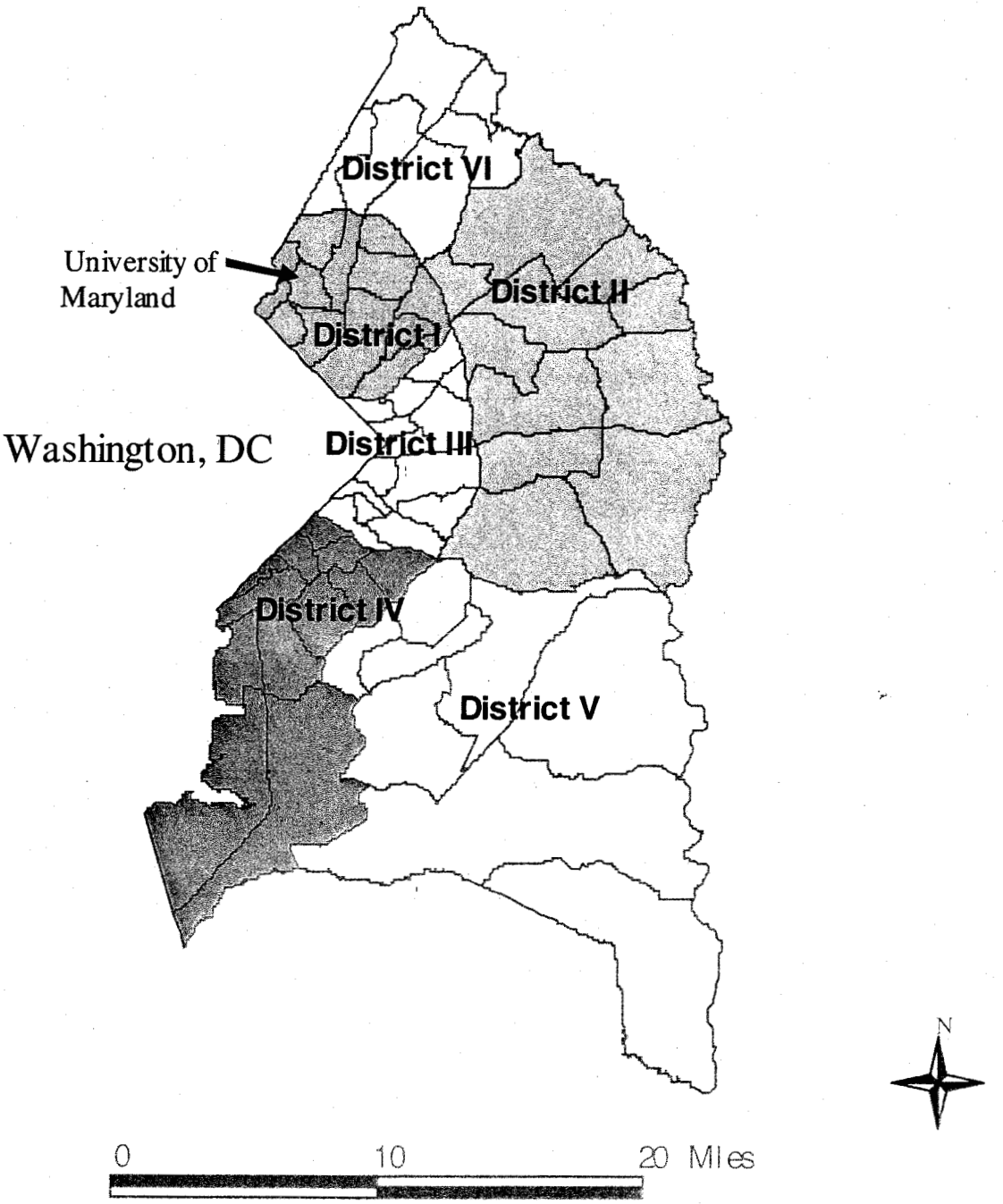


Figure 4. Six-Month Clusters of Calls for Service During Curfew Hours, Violence-Related Calls, Prince George's County, Maryland, 1996
Pre-Curfew (Top Panel) and Post-Curfew (Bottom Panel)

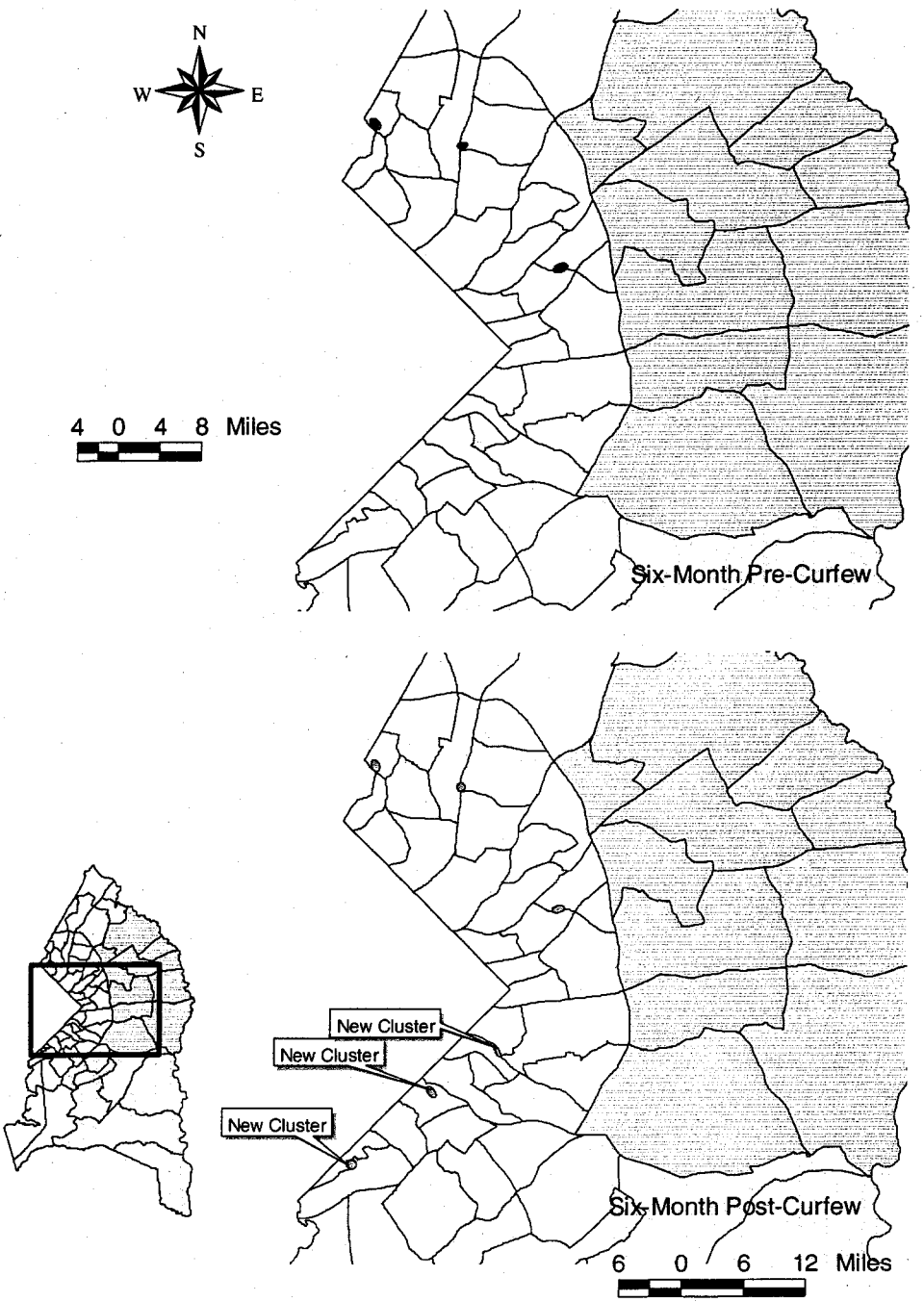


Figure 5. Six-Month Clusters of Calls for Service During Curfew Hours, Property-Related Calls, Prince George's County, Maryland, 1996
Pre-Curfew (Top Panel) and Post-Curfew (Bottom Panel)

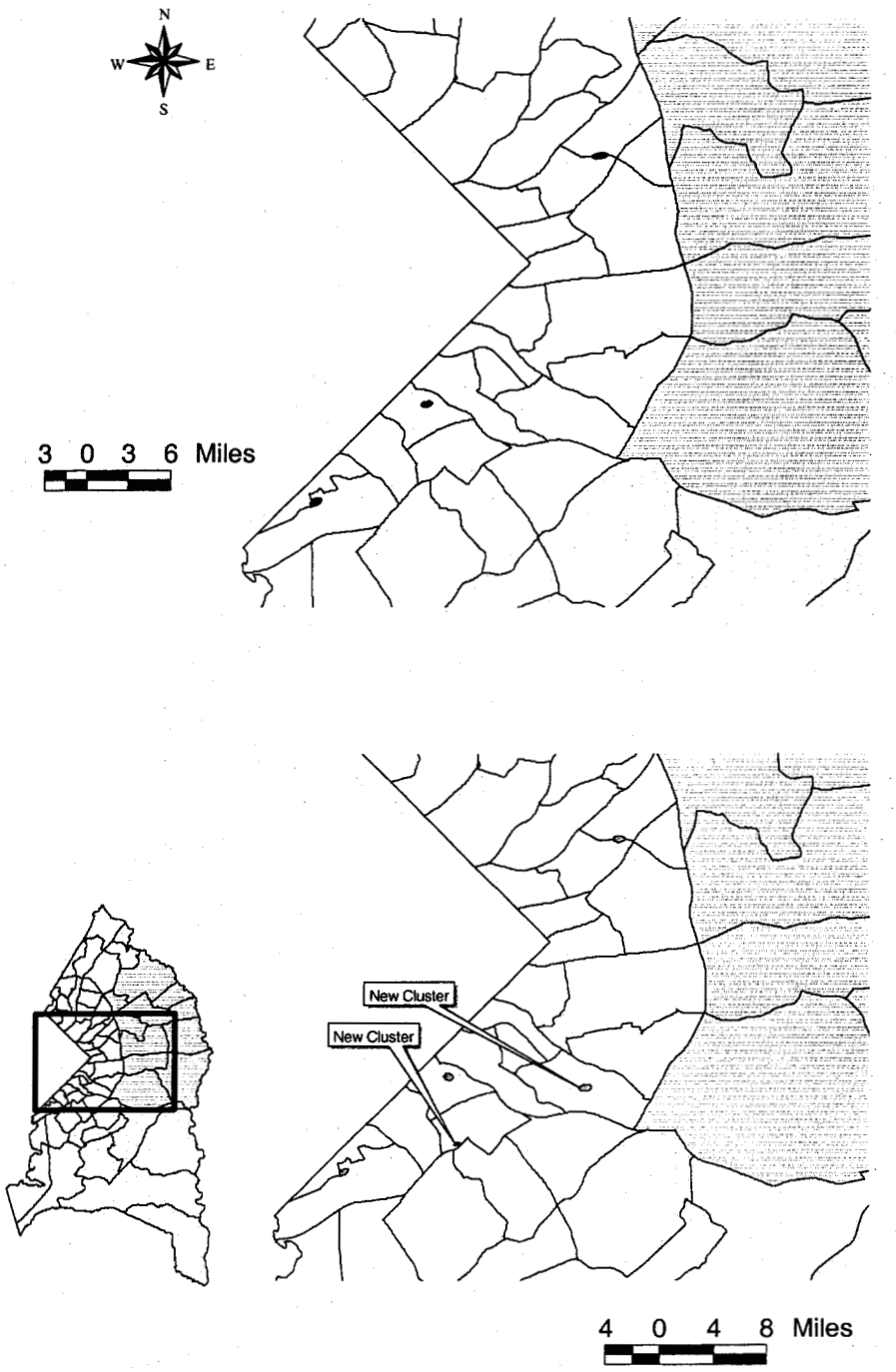


Figure 6. Six-Month Clusters of Calls for Service During Curfew Hours, Disorder-Related Calls, Prince George's County, Maryland, 1996
Pre-Curfew (Top Panel) and Post-Curfew (Bottom Panel)

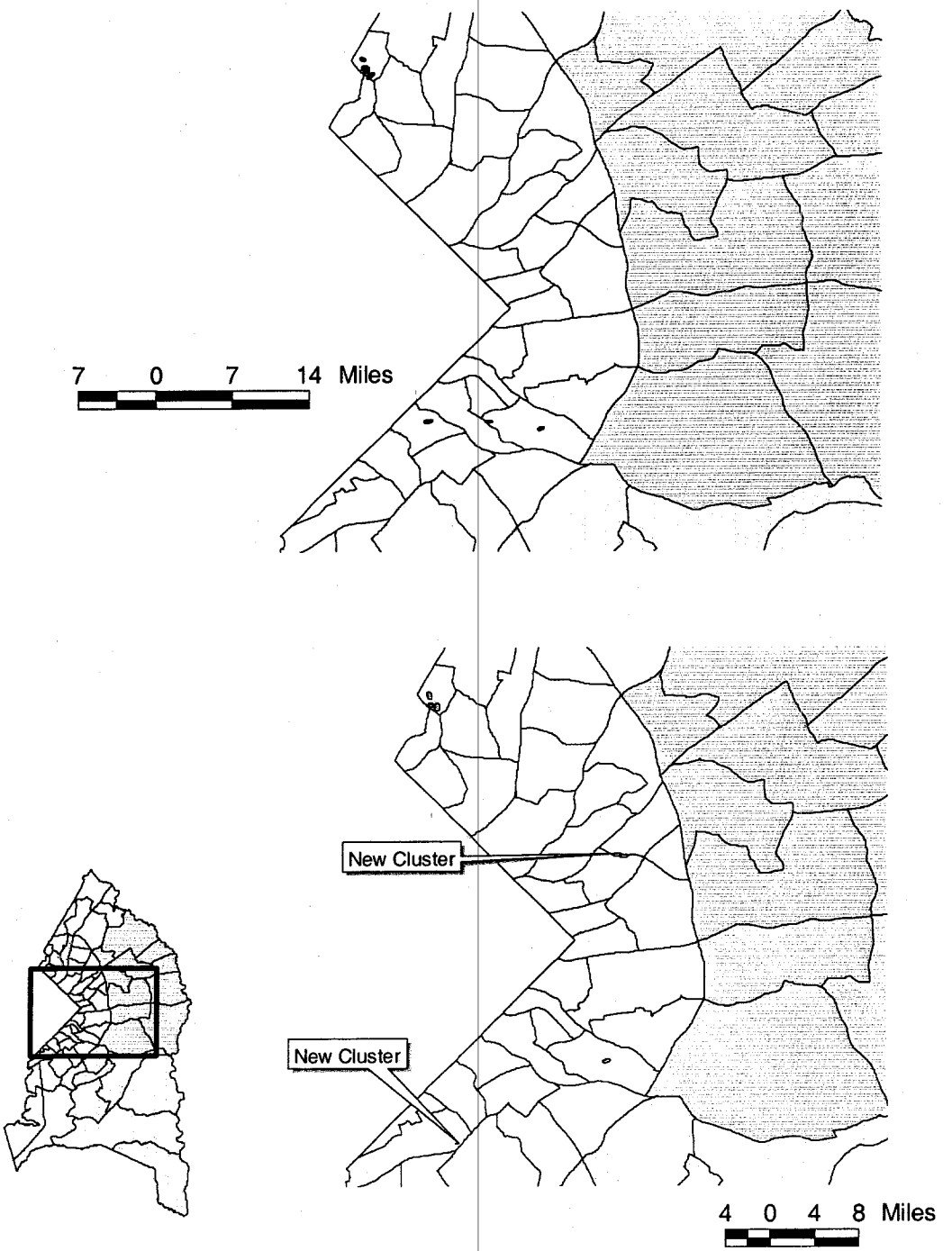
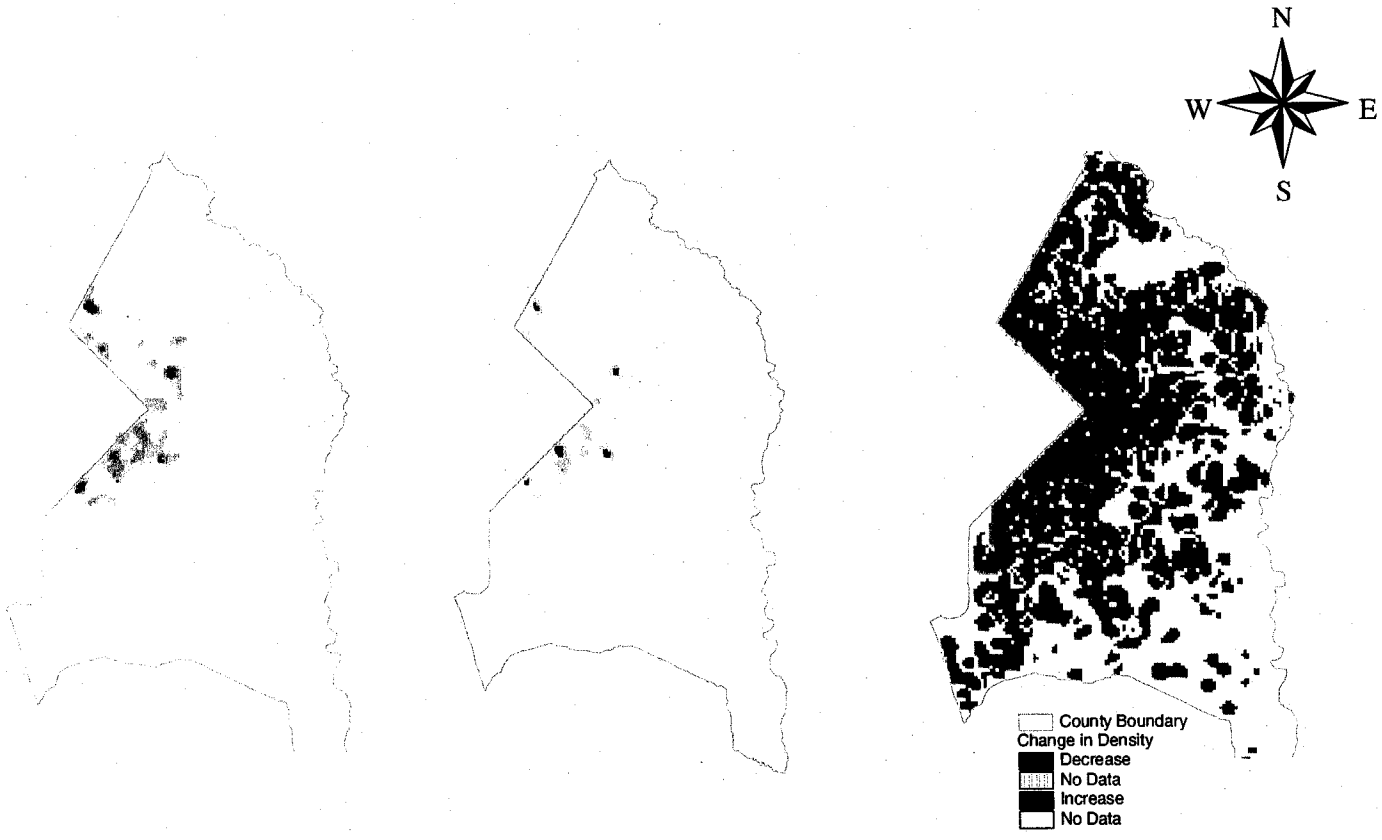


Figure 7. Kernel Density of Calls for Service, Property-Related Calls, 12-Month Periods, Pre- and Post Curfew, and Change in Density



Density of Property Related Calls
12 Month Pre-Curfew

Density of Property Related Calls
12 Month Post Curfew

Change in Density

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Appendix 1

Calls for Service Data Reduction

Several steps were taken to clean the PG County calls for service data.

Step 1. Database Reduction

The researchers first examined raw data from the PG County calls for service database (1995-1998). There were 2,007,441 observations in the raw database. After clarification with PG county officials, the researchers took preliminary steps to reduce the size of the database by (1) deleting peripheral variables and (2) deleting offense types that were not to be included in the final database. The researchers deleted a total of 7 variables that were peripheral, or not to be used for the analysis. The database also contained several types of calls that were considered technical or not related to the calls for service that we intended to document. A few of these call types included: death report, drowning, wires down, suicide, and test call. The elimination of these offense types reduced the observations to 1,547,796, and the elimination of other variables also helped to reduce overall size of the database. The final list of variables and researcher categorizations follows:

Data Dictionary for PG County Calls for Service Database, 1995-1998*

INCTYPE	Description	Main category
VAR NAME:		
KIDNAP	Kidnapping	
LATAE (LATE, LATE<, LATEA)		
MISS	Missing person	
ESCAPE	Escape	
CDS	Controlled dangerous substance	DISORDER
DISORD	Disorderly	DISORDER
FRAUD	Check and Fraud	DISORDER
GAMBLE	Gambling offense	DISORDER
LIQOUR	Liquor offense	DISORDER
LOITER	Loitering	DISORDER
PARTY	Loud party	DISORDER
MUSIC		DISORDER
GNSHOT	Gunshots, sound of shots	DISORDER
DOMEST	Domestic	DOMESTIC
JUVS	Juvenile complaint	OTHER
CKPER	Check suspicious person	OTHER
CKPREM	Check premises	OTHER
CKWEAP	Check armed person	OTHER
CROSS	Cross burning	OTHER
OTHER	Other offense, incident	OTHER
UNK	Unknown trouble	OTHER
PROWL	Prowler	OTHER
STALK	Stalker	OTHER

FOUND	Found property, juvenile	PROP
TAMPER	Tampering	PROP
PALR ;, PALRMC, PALRMR, PALRMS	Property alarms, commercial and residential	PROP
TRES	Trespassing	PROP
BREAK (BREAK|)	Break-in, in progress	PROP
PBS	Purse snatching	VIOLENT
SHOPL	Shoplifting	PROP
STLVEH (STLVEL)	Stolen vehicle	PROP
THEFT (THEFTA, THEFT|)	Theft, Theft from auto	PROP
PROPDA	Property damage	PROP
VANDAL	Vandalism	PROP
ACC (ACCD, ACCDC, ACCH, ACCHC, ACCMC, ACCP, ACCPC, ACCS, ACCSC)	Accidents (Departmental, with injury (street, highway), pedestrian struck)	TRAFFIC
DWI	Driving while intoxicated	TRAFFIC
HIT (HITI, HITC)	Hit and run (hiti, hit and run with injury)	TRAFFIC
TRAF (TRF?)	Traffic offense	TRAFFIC
ASLT (ASLTC, ASLT|)	Assault	VIOLENT
HALARM	Hold-up alarm	VIOLENT
CARJACK	Car jacking	VIOLENT
CUT	Cutting / stabbing	VIOLENT
FIGHT	Fight	VIOLENT
INJUR (INJURC)	Injured person	VIOLENT
RAPE (RAPEC)	Rape	VIOLENT
ROBB (ROBB|, ROBCIT)	Robbery of T/A, Robbery of citizen	VIOLENT
HOMIC	Homicide	VIOLENT
SHOOT (SHOOTC)	Shooting	VIOLENT
SEX	Sex offense	VIOLENT

*Researchers eventually dropped shaded categories

Step 2. Programming: Cleaning addresses

Researchers wrote several stepwise SAS programs to clean the multiple problems in location fields that prevented the addresses from geocoding properly. ARCview has the capabilities to read street addresses and intersections, but not apartment numbers, abbreviated names (in some cases), intersections including 'near' or 'and' (ARCview only reads '&'), cities in the location field, or auxiliary information at the end of an address. A few examples of unreadable addresses located in the databases include:

- 4856 MARLBORO PE ;R**D's BAR & GRILL
- 4700 ALLENTOWN RD @ANDREWS AIR FORCE
- 120 WESTHAMPTON AV , SEAT PLEASANT, MD
- 3823 EVES LA #377
- 123 EAST RIDGE DR NEAR GROVE PL
- MCDONALDS; 254 LAPSLY LA

There was another type of problem found exclusively in the traffic offense locations. During one particular six-month period, it seems that addresses for traffic

offense locations were combined with other descriptions (i.e., car descriptions, people descriptions, and license plates)[1]. Due to lack of any consistent patterns, cleaning of some of these locations had to be done on a case-by-case basis. Because of the magnitude of addresses, the researchers opted instead to exclude traffic offenses from the total database. If time allows, a traffic analysis will be performed on this data.

Step 3. Final Runs

Final runs were made using projected streets file obtained from GeoLytics (2000). Several thousand more addresses matched to the updated streets file. After fine tuning the remaining addresses and deleting several more variables that the researchers found not useful for the purposes of this study, 1045086 observation were included in the final dataset (without traffic offenses). The researchers ran a batch geocode job on this data, yielding the following results: 1010203 observations matched (96.7% match), and 3.3% did not match (34,883 observations)[2]. Approximately 1/3 of these unmatched addresses were obviously not legitimate addresses; these address fields contained things like descriptions of people or places and other random information. ARCview did not recognize the remaining unmatched addresses, for a variety of reasons, like wrong street numbers, misspellings, or vague intersections and/or addresses (i.e. I95 Northbound). The researchers decided not to attempt an interactive rematch session because of the high match rate.

During the analysis, the researchers discovered that several call types in the property category were not present in all four years. Representatives at the police department told us that the code for property alarms (residential and commercial) were not captured in 1995. Property alarm calls accounted for a substantial amount of calls, therefore, the numbers for 1995 were very low and the numbers for the remaining years were much higher. To make this variable comparable over the years, all property alarm related calls were removed from the final database. The total number of observations was reduced to 814,417.

Only three categories of calls were used for the final curfew analysis: (1)violence, (2) property, and (3) disorder.

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[1] A rough indication of this problem is shown with the results of a trial ARCview geocoding run at this time. There were 1,317,438 observations in total database (excluding traffic), with 8% of locations not matching. Next, the researchers geocoded the traffic data (230358 observations) and found that17% of locations did not match. Further, these addresses that did not match were concentrated in the 6-month period indicated earlier; about 40% of the unmatched records were from a 6-month period from January 1995 to June 1995.

[2] Inspection of the data revealed that we were missing approximately one month's worth of data. We requested a drop of this data (46983 observations), followed the cleaning steps, and geocoded this batch. 96% of the final dataset matched (44919 observations). This data was merged with the main data set for a total of 1,055,122 observations.