The Impact of Policing and Other Criminal and Juvenile Justice Trends on Juvenile Violence in Large Cities, 1994-2000

A Report from the "Understanding the 'Whys' Behind Juvenile Crime Trends" Project

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1. INTRODUCTION

This paper reports research that was conducted as part of the University of Pennsylvania's project on "Understanding the 'Whys' Behind Juvenile Crime Trends." The "Whys" project, which was funded by the Office of Juvenile Justice and Delinquency Prevention of the U.S. Department of Justice, was conducted to develop a better understanding of the downturn in juvenile crime that occurred in the 1990s and to use this knowledge to help practitioners and policymakers understand potential leading indicators of turning points in local juvenile crime trends. The main volume of the Whys report (which is available online at https://www.ncjrs.gov/pdffiles1/ojjdp/grants/248954.pdf and at www.whysproject.org) discusses juvenile violence trends from the 1980s through the early 2000s and assesses evidence on a wide variety of community, developmental, cultural, and policy factors that have been hypothesized as possible causes of juvenile crime trends during this period. (Primary contributors to the main Whys report include Jeffrey Roth (project director), Reagan Daly, Christopher Koper, James Lynch, Howard Snyder, Monica Robbers, and other staff of CSR Incorporated.)

The study reported in this paper was conducted as a complement to Chapter 5 of the Whys report, which examines national trends and research on public policies and practices, including those in the criminal and juvenile justice systems, that may have affected juvenile violence during the 1990s. (Readers interested in this background material, which is not reviewed here, should consult Chapter 5 of the Whys report.) As an extension of that work, this paper presents original research examining whether and how changes in criminal and juvenile justice practices and policies affected juvenile violence in urban areas during the 1990s. As discussed in the Whys report, there has been relatively little research directly testing the effects of changes in criminal and juvenile justice practices on the crime drop of the 1990s. Much of the evidence on these matters is indirect. This is particularly true with respect to the drop in juvenile violence. To address this gap in our understanding of the juvenile crime drop, we directly examine whether selected changes in policing, adult incarceration, juvenile detention, and juvenile waivers to adult court reduced juvenile violence in a sample of large U.S. cities from 1994 to 2000, controlling for changes in a variety of community characteristics. In sum, we find indications that police resources and strategies helped to reduce juvenile violence during the 1990s, but we find little or no evidence of beneficial effects from adult incarceration, juvenile detention, or waivers of juveniles to adult court.

2. DATA AND METHODS

2.1. Study Sample

This analysis is based on a sample of 97 cities that had a population of 100,000 or more during the 1990s. Large cities often feature prominently in the study of crime and the formulation of crime control policies. They account for a disproportionate amount of the nation's crime, and they played a major role in driving national crime trends during the 1980s and 1990s (e.g., see Blumstein 2000, pp. 35-39). This is particularly true for juvenile homicide, which is one of our primary outcome measures.

Our sample does not include all large cities from this time period. Rather, the cities included in this study were among a national sample of jurisdictions selected at random for an evaluation of the federal Community Oriented Policing Services Program (commonly known as the COPS program) that was conducted between 1995 and 2000 (Johnson and Roth, 2003; Koper et al., 2002; Roth et al., 2000).[1] We selected this particular group of cities primarily so that we could include an examination of community policing strategies as part of the study. As discussed in Chapter 5 of the Whys report, community policing was an important policing innovation during the 1990s; however, there has been little research examining the effects of national trends in community policing on crime and none that has assessed its specific impact on trends in juvenile violence. As part of the COPS evaluation study, researchers collected extensive information through surveys on the use of community policing strategies and tactics in the study jurisdictions at four time points: 1994, 1996, 1998, and 2000 (the community policing measures are discussed below). Hence, our study sample comprises bi-annual panel data on community policing and other measures for these 97 cities at 4 time points (for a total of 388 city-year observations).[2] A list of our 97 cities is included in Appendix A.

2.2. Study Measures

2.2.1. Measures of Juvenile Violence

We utilized three indicators of juvenile violence: the juvenile arrest rate for all serious violent crime (which includes murder, robbery, aggravated assault, and rape); the juvenile arrest rate for murder and robbery; and the juvenile arrest rate for murder. Data for these variables come from the Uniform Crime Reports (UCR), and each was measured per 100,000 juveniles ages 10-17. Separate analyses were performed for murder and robbery arrests because these crimes are considered to be more accurately measured than other violent crimes (e.g., Blumstein, 2000). Murder is widely considered to be the most accurately measured single crime, but it is rare.[3]

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[1] The federal COPS program was a $9 billion initiative intended to put 100,000 additional police in America's communities and to promote the spread of community policing (see Chapter 5).

[2] The cities selected for the analysis all had populations of 100,000 or more as of 1986. Consequently, they are more likely to have experienced the rising juvenile violence rates of the late 1980s and the falling rates of the 1990s. The national COPS evaluation sample included 114 cities in this size range. However, 17 of these cities were dropped from the analysis because they did not have usable juvenile violence data for at least 3 of the four years under study. (See footnote 3.) Our final sample of 97 cities represents 56% of the 173 cities that had a population of 100,000 or more throughout the 1980s and 1990s.

[3] The following procedures were used to adjust for cases (i.e., city-years) in which arrest data were not reported or were reported for less than twelve months. For cases with more than eight months of reported data but less than twelve, the arrest total was estimated by multiplying the reported arrests by the ratio of twelve divided by the number of months reported. For the remaining problematic cases, arrest counts were imputed by averaging the values of the prior and subsequent years (for that city), provided that adequate data were available for those years. Cities that were still missing more than one year of data after these procedures were excluded (hence, cities were retained for the study if they had usable data for at least three years). Using this set of rules, 17 of the original sample of 114 cities (see footnote 2) were excluded from the analysis, leaving our sample of 97 cities examined here. Data for 11 of the remaining city-year observations (2.8%) were adjusted or estimated.

Arrest data provide the only source available for studying aggregate trends in juvenile violence across units such as cities and counties. However, they have a number of limitations as measures of juvenile violence. To begin with, their validity and reliability can be affected by reporting practices (among both citizens and police), the success of police in solving reported offenses, and discretionary decisions by police in the handling of juvenile offenders. In other words, they measure citizen and police reactions to juvenile violence as well as juvenile violence itself.[4] Another limitation is that arrest data provide counts of offenders rather than incidents.

Nonetheless, arrest data should provide a reasonable basis for studying trends over time in juvenile violence across jurisdictions. As shown in Chapter 2 of the Whys report, trends in juvenile violence as estimated by arrest data were quite consistent during the 1990s with those estimated from the National Crime Victimization Survey. Furthermore, previous research has shown that there is much consistency in both the individual-level and community-level correlates of juvenile crime, particularly that of a more serious nature, across official data (both arrests and citizen calls for service), victimization surveys, and self-reports by offenders (e.g., see Hindelang, 1978; Hindelang et al., 1979; Osgood and Chambers, 2000: 91). Accordingly, we can expect our analysis of juvenile arrest data to provide reasonable estimates of the correlates of juvenile offending at the community level.

Our focus on serious violence should also minimize biases stemming from differential reporting and discretionary handling of delinquents by police across jurisdictions. Further, as discussed below, our analysis is based on fixed effects models which control for unmeasured differences between units that are stable over time. Consequently, unmeasured differences between cities in the reporting and handling of juvenile violence are controlled in our analysis, provided that these differences remained constant during the study period.

2.2.2. Measures of Criminal and Juvenile Justice Practices and Policies

In this analysis, we examine the impacts of a number of criminal and juvenile justice trends discussed in Chapter 5 of the Whys report. These include changes in police staffing and strategies, growth in adult incarceration, and the trend towards more punitive treatment of juvenile offenders. The policy variables described below were measured for each city and year.

2.2.2.1. Policing Variables

We sought to examine the effects of three major trends in policing during the 1990s. First, to assess the impact of increases in police staffing (nationally, local police and Sheriffs added over 117,000 officers from 1990 to 1999), we used the number of officers per 100,000 city residents (as provided in the UCR) as an indicator of policing levels. Second, we tested the

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[4] UCR figures published by the Federal Bureau of Investigation (see http://www.fbi.gov/ucr/ucr.htm#cius) show that overall clearance rates for violent crime (including crimes by both adults and juveniles) increased from 45% in 1995 to 50% in 1999, before falling somewhat to under 48% in 2000 (and lower in subsequent years). This suggests that police were becoming somewhat more successful at apprehending violent offenders during the late 1990s. As a caveat, therefore, our juvenile arrest measures may understate decreases in juvenile violence and overstate increases in juvenile violence. Nevertheless, as noted below and in Chapter 2 of the Whys report, national trends in juvenile violence were largely consistent during the 1990s as measured by arrest data and victimization survey data.

effects of the trend towards more proactive, order maintenance policing using the number of arrests per officer for disorderly conduct and driving under the influence as a measure of proactive policing. This measure of proactive policing, calculated from UCR data, was initially developed by Sampson and Cohen (1988), who found it to be inversely related to levels of juvenile robbery. Others have also found this measure to be inversely related to rates of robbery and other violence (MacDonald 2002; Kubrin et al. 2010).

Third, we examined the effects of the community policing movement using two measures. One is a global indicator of community policing based on a scale of 37 tactics measured in the national COPS evaluation. These tactics are listed in Appendix B and fall into the general areas of crime prevention, police-citizen partnerships, problem-solving, and organizational change. This measure provides a comprehensive and holistic indicator of community policing practices, but a few limitations to the measure should be noted. One is that it provides the number of community policing tactics used by the agencies but does capture the quality or intensity of those efforts. The other is that it may obscure those aspects of community policing that are most important to crime reduction. As an additional measure of community policing, we also utilized a separate measure of community cooperation with police based on a six-item scale from the national COPS evaluation. These items, which are also listed in Appendix B, reflect the extent to which community members and groups provided information, ideas, and other resources to police (ranked on a three point scale ranging from almost never to frequently). The community policing and community input scales are both additive; Cronbach's alpha scores were .86 for the former scale and .82 for the latter.[5]

2.2.2.2. Adult Incarceration

The Census of State and Federal Adult Correctional Facilities, conducted by the Bureau of Justice Statistics, was used to measure the rate (per 100,000 individuals) of incarceration in adult correctional facilities at the state level. As discussed in the Whys report, the rate of adult incarceration increased 154% from 1990 to 1999. Although the number of juveniles incarcerated in adult facilities was relatively small during this period, we hypothesized that growing levels of adult incarceration may have also affected juvenile violence through incapacitation of adults who co-offended with juveniles and/or through general deterrence of juvenile crime.

2.2.2.3. Juvenile Justice Variables

Finally, we examined two measures of juvenile justice policy that reflect a trend towards more punitive treatment of juvenile offenders during the 1990s. First, the state-level juvenile detention rate (per 100,000 juveniles ages 10 to 17) was measured from the Children in Custody Census (CICC) and the Census of Juveniles in Residential Placement (CJRP), both administered by the Office of Juvenile Justice and Delinquency Prevention. (The Census of Juveniles in Residential Placement replaced the Children in Custody Census beginning in 1997; the main

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[5] In preliminary analysis, we used both exploratory and confirmatory (i.e., theory-driven) factor analysis to examine whether each of these scales (particularly the community policing scale) should be divided into multiple scales. However, correlations among subsets of items in these scales were not consistent over time, and scales based on all items provided superior values for Cronbach's alpha.

difference between the two surveys is that the CICC collected aggregate data on persons less than 21 years of age in facilities, while the CJRP collects individual data on each person under 21 housed in a facility.) For the juvenile detention surveys, data were only available for odd-numbered years between 1987 and 2001; values for even-numbered years were estimated by averaging the values for adjacent years. As discussed in the Whys report, juveniles held in detention increased throughout the 1990s even while juvenile crime declined. We sought to determine whether this trend had incapacitation, deterrent, or aggravating effects on juvenile violence during the 1990s.

Second, we assessed the impact of state-level statutory exclusion laws mandating the waiver of certain juvenile offenders to adult court, as reported by Steiner et al. (2006). Generally, these laws target violent juvenile offenders, although the severity of violence making one eligible for waiver varies by state. During the 1990s, 45 states passed laws expanding or easing the transfer of juveniles to adult court (see Chapter 5 of the Whys report and Snyder and Sickmund 2006). We chose to focus on statutory waiver laws because they represent the most severe form of juvenile transfer policy and, as such, are perhaps more likely to be widely known in the community. Fourteen states passed such laws during the 1990s, and others had them before that time. Although available research suggests that these laws have not reduced juvenile crime and may have in fact increased it (e.g., see Cohn and Mialon 2010; Redding 2010; Steiner et al. 2006), we sought to confirm this for the context of urban violence during the 1990s (prior studies have generally focused on individual or state-level data and have not specifically focused on the juvenile crime drop of the 1990s).

2.2.3. Other Influences on Juvenile Violence

In addition to the policy variables described above, the analysis includes a variety of demographic and socioeconomic factors taken from the 1990 and 2000 Census surveys. Values for intermediate years were linearly interpolated. The Census variables can be divided into five categories as listed below.

- Population structure: total population; population density; and percentage of the population ages 15-29
- Racial/ethnic composition: percentage of the population that was African-American; percentage foreign-born; and percentage Latino
- Residential mobility: percentage of occupied housing that was owner-occupied and percentage of individuals 5 years and older who lived in the same house 5 years previously
- Family disruption: percentage of households with related children under 18 that were headed by a single female; and percentage of the female (or male) population 15 years and older that was divorced[6]
- Economic factors: percentage of the population living below the poverty line; total per capita income (adjusted for inflation); and the unemployment rate (per 100,000 individuals 16 years and older in the workforce)

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[6] Only one sex was chosen for each model, based on whichever variable was more strongly correlated to the outcome.

To control for trends in illegal drug use and sales—particularly those associated with crack cocaine—we also utilized the arrest rate per 100,000 for illegal drug sales as recorded in the UCR. Although drug arrests partially reflect variation in drug enforcement practices between places and over time, arrests for harder drugs such as cocaine and heroin are highly correlated with other independent indicators of drug use (such as drug-related emergency room admissions) and are often used as a gauge of drug use and sales in a jurisdiction (Rosenfeld and Decker, 1999; also see Cork, 1999; Ousey and Augustine, 2001; and Ousey and Lee, 2002).[7]

The average juvenile arrest rate for violent crime from 1991 through 1993 was used to control for regression to the mean, based on the notion that cities with the highest levels of juvenile violence in the early 1990s may have been most likely to experience drops in juvenile violence later in the decade and to make changes in criminal and juvenile justice practices during the 1990s (e.g., add more police and pass more punitive policies). (In each model, the pre-1994 violence measure corresponds to the same crime or crimes as the dependent variable.) Finally, as described below, the analysis controls for unmeasured differences between cities that were stable over time (i.e., city fixed effects) as well as time trends that were common across the cities (i.e., yearly fixed effects).

2.3. Statistical Methods

In preliminary analysis, we estimated a standard fixed effects model in which the juvenile violence measures were regressed on the predictors described above plus a series of indicators for specific cities (to capture city fixed effects) and specific years (to capture common time trends). (This method is also known as least squares with dummy variables, or LSDV.) However, this model suffered from extreme multicollinearity, stemming largely from the city indicators, even after combining other highly correlated explanatory variables into scale measures.

Therefore, as an alternative approach for removing the city-level fixed effects, we transformed the outcome and primary predictor variables to represent deviations from their city-specific means (e.g., see Allison 2005; Johnston and DiNardo, 1997: 397-399).[8] In a generalized form, our model can be expressed as:

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[7] Drug arrests in the UCR are broken down into arrests for possession and arrests for manufacturing or sale. Within each of these categories, the arrests are presented by drug type. However, not all agencies report drug arrests, and those that do may not subdivide the arrests by offense type or drug type. Further, arrests for offenses involving crack cocaine are grouped with other arrests for cocaine, opium, and their derivatives and do not appear separately. For all of these reasons, we employed the arrest rate for all illegal drug sales.

[8] This is also known as the within group estimator. We also considered removing the city fixed effects through change score models (in which the data are converted into first differences). Using a change score approach would have reduced the length of the panel series from four data points to three. Further, as discussed below, our analysis focuses on the lagged effects of the policy indicators in order to avoid potential problems with simultaneity bias. Using change score models with lagged effects would have thus restricted us to examining changes during only two points, 1996 to 1998 and 1998 to 2000. Another disadvantage to change score models is that they tend to amplify the effects of measurement error and random variation in how social indicators change over short time periods. This attenuates regression coefficients and reduces variance explained (Allison, 1990; Gillespie and Streeter, 1994; Johnston and DiNardo, 1997: 399-401). Based on these considerations, we did not estimate change score models.

$$Y_{it} - \alpha Y_i = \beta(X_{it} - \alpha X_i) + \phi Z_i + \lambda_t + \varepsilon_{it}$$

where $Y_{it} - \alpha Y_i$ is the juvenile violence measure of interest, measured for each city (i) and time period (t) as a deviation from that city's mean, αY_i, for the entire period; β corresponds to the effects of other time-varying covariates (e.g., police practices, socioeconomic indicators) also measured for each city and time period as a deviation from that city's mean level; ϕ represents the effect of the pre-1994 juvenile violence rate, which serves as a time-invariant characteristic, Z_i, measured for each city; λ_t corresponds to national changes in crime rates for each time period, t (i.e., fixed effects for each time period); and ε_{it} is an error term.

To avoid potential problems with simultaneity bias, we focus on the lagged effects of our policy measures.[9] Hence, we used the values of the policy measures during 1994, 1996, and 1998 to predict juvenile violence during 1996, 1998, and 2000, respectively. An exception is that we could not examine lagged effects from the police agency community input scale, which was only measured for 1996, 1998, and 2000. Using lagged policy measures also allows for the possibility that the effects of some policies and practices may take time to be fully realized. For example, the impact of increases in police staffing may not be fully felt until police agencies have time to train and deploy the officers. Similarly, direct and vicarious experiences that young juveniles have with criminal and juvenile justice authorities may affect their behavior most acutely when they reach the ages at which serious delinquency is most common. However, we note that our focus on lagged effects may miss contemporaneous effects of the policy measures, thereby understating their full impacts.

We estimated the models using generalized estimating equations (GEE—see Liang and Zeger 1986) with standard errors that are robust to heteroskedasticity and adjusted for dependence between observations from the same city (i.e., city-level clustering).[10] The GEE method also allows one to test for different forms of dependence (i.e., autocorrelation) between observations from the same unit. For each model, we tested for different forms of autocorrelation (e.g., an autoregressive process or exchangeable correlations between observations) and selected the best model as determined by the QIC fit statistic (Pan 2001).

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[9] In other words, the contemporaneous associations between policy variables and juvenile violence may reflect the impact of juvenile crime on policy rather than—or in addition to—the impact of policy on juvenile violence (feedback problems of this sort are commonly referred to as simultaneity bias). A related concern is that the policy measures may have been affected by lagged values of juvenile violence. We attempted to mitigate this concern in two ways. First, we controlled for pre-1994 values of juvenile violence, which, as stated above, may have influenced policy decisions made later in the decade. Because juvenile violence peaked during the early years of the 1990s, violence during these years may have been particularly influential in later policy decisions. Using the pre-1994 violence measure also circumvents the complexities (i.e., bias) caused by using lagged dependent variables. Second, as discussed below, our models control for autocorrelation, which also lessens the risk that juvenile violence at time t will be related to past values of the policy variables through a common association with previous values of juvenile violence as captured in the error term.

[10] The models were estimated using PROC GENMOD in SAS software.

Below, we present models based on both weighted and non-weighted data. The former models were weighted by the size of the juvenile population ages 10-17 to provide further adjustment for heteroskedasticity in the data (preliminary analysis revealed that residual variance decreased as the juvenile population increased). In addition, the weighted models may better approximate national trends, which are more heavily influenced by larger cities.[11]

Diagnostic tests for multicollinearity generally revealed no serious problems for the substantive variables once the data were transformed into mean deviations, though it was still necessary to remove one variable—the percentage of households with children under 18 headed by a single female—that continued to show a very high variance inflation factor (VIF). After removing this variable, only the year indicators had VIFs greater than 10, a common guideline for identifying excessive multicollinearity (Neter et al. 1989: 409). Among the policy variables, only the adult incarceration rate had a VIF higher than 5.

Finally, while the mean-deviation models are equivalent to least squares with fixed effects, the comparability of the estimates can be affected somewhat by the presence of missing data. Because of this and the short length of the data series, we estimated our models using both the full sample of 97 cities and a subsample of 74 cities (also listed in Appendix A) that had complete data on all study variables for all years. This subset of 74 cities did not differ significantly from the full sample with respect to population size or the juvenile violence measures.[12]

3. RESULTS

3.1. Trends in Juvenile Violence and Criminal/Juvenile Justice Measures, 1994-2000

We begin by describing the key changes in our outcome and policy variables from 1994 to 2000. For simplicity, we focus on changes in the 74 cities that had complete data for all years. As shown in Table 1, overall rates for serious juvenile violence declined by 37.5%, the combined rate for juvenile murder and robbery declined by 48.6%, and the juvenile murder rate declined by 74.5%. The drop in violence was nearly universal; for each outcome, 86% to 89% of the cities experienced a decline. Consequently, our analysis has more relevance to assessing variation in the rate of decline in juvenile violence among these cities than to assessing whether or not they experienced a decline.

Turning to the key policy variables, there were increases in police staffing, the use of community policing, the adult incarceration rate, and the use of juvenile transfer laws (regarding the latter, the number of cities located in states having these laws increased from 6 in 1994 to 14

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[11] To assess whether the data should be weighted using sample weights from the national COPS evaluation, we tested whether the probability of selection into the sample was related to the dependent variables, conditional on the other explanatory factors. To this end, the outcome measures were regressed on the model variables plus a set of indicators representing the weighting categories from the COPS study. F-tests for the set of weighting categories were not significant; thus we concluded that the COPS study sample weights were not necessary for the weighting scheme used here.

[12] These tests compared the subset of 74 agencies to the full group of 114 cities originally sampled for the COPS evaluation (see footnote 3).

in 2000). In contrast, proactive policing, as measured by DUI and disorderly conduct arrests per officer, declined during this period. However, this decline must be gauged against the backdrop of sharply falling rates of juvenile (and total) violence. Relative to the trend in juvenile violence, proactive policing increased during the 1990s because the drop in the proactive policing measure was considerably less than that for the juvenile violence measures. This suggests that police placed a growing emphasis on order maintenance policing throughout the decade. A similar argument can be made for the rate of juvenile detention, which increased slightly (2.3%) despite the falling rates of juvenile violence—a trend indicative of increasing punitiveness in the juvenile justice system.

Table 1: Changes in Key Measures of Juvenile Violence and Criminal / Juvenile Justice Policy and Practice, 1994-2000

Measure	1994	2000	% Change
Outcome Measures: Juvenile violence arrest rate (per 10,000 juveniles, 10-17)	83.1	51.9	-37.5%
Juvenile murder and robbery arrest rate	36.2	18.6	-48.6%
Juvenile murder arrest rate	3.2	.8	-74.5%
Policy Measures: Police officers per population	208.81	229.83	10.0%
Arrests for disorderly and DUI per officer	3.59	3.03	-15.6%
Community policing strategies	25.54	27.77	8.7%
Incarceration rate	383.18	469.45	22.5%
Juvenile custody rate	31.0	31.7	2.3%
Statutory waiver	6	14	133.3%

N=74 cities with complete data from COPS evaluation sample

3.2. Model Results

3.2.1. Policy Indicators

In the tables below, we present four models for each outcome variable. Model 1, which serves as the baseline model in each table, is a weighted model based on the 74 cities with complete data. Model 2 is a non-weighted model based on these same cities. Models 3 and 4 are weighted and non-weighted models, respectively, estimated with the full sample of 97 cities.

Results from models predicting trends in total juvenile violence are presented in Table 2. In general, the policy variables did not have significant associations with juvenile violence. However, police staffing had a negative association with juvenile violence that was statistically significant ($p<=.05$) or marginally so ($.05 < p <=.10$) in the non-weighted models. In other models, this association was negative but not statistically significant. This would seem to suggest that growth in police staffing helped to reduce juvenile violence but that the effect was most pronounced among the smaller cities in the sample. The juvenile detention rate, in contrast, had a marginally significant and positive relationship with juvenile violence in one model (the weighted full sample model); in other models, the association was uniformly positive but not statistically significant.

Table 3 presents models for the combined rate of juvenile murder and robbery. Police staffing and proactive policing had consistently negative and statistically significant associations with juvenile murder and robbery in these models, indicating that growth in police staffing and an emphasis on proactive policing both helped to reduce these forms of juvenile violence. Higher juvenile detention rates were again associated with higher levels of juvenile violence, and this association was statistically significant or marginally significant in the models based on the 74 agencies with complete data.

Finally, as shown in Table 4, higher levels of police staffing were also associated with lower rates of juvenile murder.[13] This relationship was statistically significant in the weighted models and marginally significant in the non-weighted models. Greater use of community policing strategies was also associated with significantly lower rates of juvenile murder. Juvenile waiver laws, in contrast, were linked to marginally higher levels of juvenile murder in the weighted models (this association was positive but statistically non-significant in the non-weighted models).

Examination of standardized residuals from the baseline juvenile murder model (model 1) revealed a particularly large outlier observation for the city of Baltimore.[14] Re-estimating model 1 without Baltimore (results not shown) reduced the strength of the police staffing and community policing coefficients (to -.06 and -.29, respectively) but both remained statistically significant. Removing Baltimore from model 1 also produced a positive and marginally significant coefficient (.40) for the juvenile detention rate and reduced the magnitude of the juvenile waiver law coefficient to 4.34 (it remained marginally significant). We also examined the effect of removing Baltimore from the full sample weighted model (model 3). The coefficients for police staffing and community policing remained negative and statistically significant (-.06 and -.25, respectively), but the coefficient for juvenile waiver laws became non-significant. However, this model also produced a negative and moderately significant effect of -.05 for adult incarceration.

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[13] Note that one additional agency was dropped from the analysis of juvenile murder due to missing data for the pre-1994 juvenile murder rate.

[14] For each outcome measure, we examined studentized residuals from the weighted models using cases with complete data. Cases for Baltimore produced relatively large residuals (i.e., studentized residuals greater than 2.5 in absolute magnitude) in all of these models, but only in the murder model did one of these residuals reach a particularly extreme value (10.3).

Table 2: Impacts of Criminal and Juvenile Justice Practices on Arrest Rate for Serious Juvenile Violence, 1994-2000 (Bi-Annual Fixed Effects Models)

Parameter	Model 1: 74 Cities with complete data (weighted)	Model 2: 74 Cities with complete data (non-weighted)	Model 3: 97 Cities with partial data (weighted)	Model 4: 97 Cities with partial data (non-weighted)
Policy Indicators (lagged 1 period)				
Police staffing	-.70	-.93**	-.67	-.84*
Proactive policing	1.37	.49	6.02	2.48
Community policing	-.51	-.48	-2.29	-1.82
Community input to police	-1.34	-3.07	.09	-2.76
Adult incarceration	-.25	-.35	.07	.04
Juvenile detention	.52	.004	.59	.39
Juvenile waiver law	-39.14	-62.34	-.25	2.19
Control Variables				
Population size	.001**	.002**	.001**	.002**
Population density	.01	.01	.01	.002
Percent 15-29	-46.88	-23.34	9.29	9.80
Percent black	18.11	16.38	13.24	4.96
Percent foreign born	.24	-8.60	20.73	-2.33
Percent Latino	-5.80	-7.51	-7.25	9.83
Percent divorced (females)	152.12**	105.40	94.42	66.61
Percent in poverty	74.54**	64.79**	49.23*	58.72*
Per capita income	3.97	.55	-1.42	-2.45
Percent owner-occupied housing	-6.32	-3.16	-8.30	-1.32
Residential stability	22.01	18.94	8.96	9.60
Unemployment	17.52	17.05	12.18	18.00
Drug sales	-.15	-.01	-.21	-.07
Year 1998	-151.50**	-100.35**	-119.52**	-77.43*
Year 2000	-293.539**	-204.74**	-248.05**	-176.24**
Pre-94 juvenile violence	-.05**	-.05**	-.07**	-.06**
Intercept	118.46**	84.46**	115.02**	91.86**
N	222	222	257	257

* $p <= .10$; ** $p <= .05$

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Table 3: Impacts of Criminal and Juvenile Justice Practices on Arrest Rate for Juvenile Murder and Robbery, 1994-2000 (Bi-Annual Fixed Effects Models)

Parameter	Model 1: 74 Cities with complete data (weighted)	Model 2: 74 Cities with complete data (non-weighted)	Model 3: 97 Cities with partial data (weighted)	Model 4: 97 Cities with partial data (non-weighted)
Policy Indicators (lagged 1 period)				
Police staffing	-1.05**	-1.03**	-1.14**	-1.12**
Proactive policing	-17.62**	-14.34**	-12.46*	-10.48*
Community policing	-.37	.24	-.45	.10
Community input to police	1.93	1.02	2.33	1.47
Adult incarceration	-.23	-.18	-.04	.03
Juvenile detention	4.32**	2.80*	.40	.19
Juvenile waiver law	15.28	18.85	12.02	10.97
Control Variables				
Population size	.001**	.001**	.001**	.001**
Population density	.02**	.02	.02**	.02
Percent 15-29	-1.67	8.50	14.05	19.32
Percent black	5.87	.90	2.23	-2.21
Percent foreign born	15.02	5.91	19.23*	6.84
Percent Latino	-2.63	-7.60	-1.97	-7.54
Percent divorced (females)	102.27**	87.66**	98.73**	86.01**
Percent in poverty	16.89	19.67	10.44	10.01
Per capita income	1.04	-2.45	-.45	-3.44
Percent owner-occupied housing	-4.88	8.99	-3.23	9.75
Residential stability	12.10	5.86	5.45	1.53
Unemployment	.74	1.25	.04	2.65
Drug sales	-.18	-.08	-.21*	-.10
Year 1998	-104.78**	-80.47**	-88.78**	-63.33**
Year 2000	-179.28**	-128.62**	-167.47**	-114.55**
Pre-94 juvenile murder and robbery	-.09**	-.09**	-.09**	-.09**
Intercept	70.27**	58.80**	67.25**	54.60**
N	222	222	258	258

* p<=.10; ** p <=.05

Table 4: Impacts of Criminal and Juvenile Justice Practices on Arrest Rate for Juvenile Murder, 1994-2000 (Bi-Annual Fixed Effects Models)

Parameter	Model 1: 73 Cities with complete data (weighted)	Model 2: 73 Cities with complete data (non-weighted)	Model 3: 97 Cities with partial data (weighted)	Model 4: 97 Cities with partial data (non-weighted)
Policy Indicators (lagged 1 period)				
Police staffing	-.11**	-.07*	-.11**	-.08*
Proactive policing	-.28	.57	-.17	.61
Community policing	-.44**	-.42**	-.43*	-.39**
Community input to police	.17	-.13	.02	-.09
Adult incarceration	.04	-.03	.01	-.04
Juvenile detention	.31	.06	.05	.001
Juvenile waiver law	15.89*	9.27	11.23*	4.23
Control Variables				
Population size	<.0001	<.0001	<.0001*	.0001*
Population density	.002**	.002	.002*	.001
Percent 15-29	-3.71*	-2.40	-1.18	-.24
Percent black	-2.69*	-4.21**	-2.61**	-3.90**
Percent foreign born	1.90	.79	2.13	1.02
Percent Latino	1.13	.71	1.03	.30
Percent divorced (females)	13.71*	13.89*	7.51	8.45
Percent in poverty	.45	3.05	-.41	1.79
Per capita income	.42	.21	.30	-.003
Percent owner-occupied housing	-6.00**	-3.69*	-4.91**	-2.69
Residential stability	2.54*	3.51**	1.20	2.14*
Unemployment	2.41**	3.96**	1.82	3.16**
Drug sales	-.03	-.02	-.03	-.02
Year 1998	-12.67**	-5.08	-7.52*	-.79
Year 2000	-22.80**	-10.80	-16.48**	-5.03
Pre-94 juvenile murder	-.12**	-.14**	-.13**	-.15**
Intercept	9.44**	3.92**	6.60*	1.53
N	219	219	255	255

* $p \leq .10$; ** $p \leq .05$

3.2.2. Other Results

Although our focus is on the impacts of criminal and juvenile justice practices, we also briefly review other results from the models. In assessing the effects of population characteristics, a caveat is that the values of most of these characteristics were interpolated based on Census data from 1990 and 2000. Hence, they may not represent the true pattern of changes across these bi-annual periods. Taking the results at face value, nonetheless, there were generally few indicators that were statistically significant across outcomes or across different model specifications for a given outcome. In the models of total juvenile violence, population size and poverty had expected positive associations with juvenile violence. More limited evidence suggests that higher levels of divorce were also linked to higher levels of total juvenile violence. Population size, divorce, and, in some models, population density and the percent foreign-born were significant predictors of the combined rate of juvenile murder and robbery.

The models of juvenile murder produced the most significant coefficients. This may reflect different causal mechanisms influencing different forms of juvenile crime. At the same time, it is perhaps telling in that murder is the most accurately measured crime and the crime for which police undoubtedly have the least discretion in their handling of juvenile offenders—both of which should make the arrest rate for juvenile murder a more accurate measure of violence trends. The percent of the population that was black, the unemployment rate, owner-occupied housing, and residential stability were consistent or fairly consistent predictors of juvenile murder. To a lesser extent, juvenile murder was also associated with population size and density, the divorce rate, and the percent of the population that was 15-29. Contrary to expectations, the most consistent predictor of juvenile murder—the percent black—had a negative coefficient. This can likely be explained by the fact that the rise and fall of juvenile murder in the late 1980s and 1990s were most pronounced among black youth. Thus, our results likely reflect some aspect of the drop in murder among black youth that is not explained by other variables in the models.

However, the significant correlates of juvenile violence did not all change in a way that was consistent with the crime drop. Based on changes in these measures (not shown) and the signs of the model coefficients, it appears that the socioeconomic trends most clearly linked to the drop in one or more forms of juvenile violence in these cities included reductions in population density and unemployment and increases in home ownership, residential stability, and the percent black.[15]

The time period indicators for 1998 and 2000 had large and statistically significant effects in most models, reflecting time trends that were common across the sample (1996 was excluded as the reference year). These indicators show that there was a strong downward trend in juvenile violence across the sample that was not captured by the substantive indicators. The term for pre-1994 juvenile violence was also negative and statistically significant in all models,

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[15] Generally, our interpolations suggest that these factors changed only slightly during the study years. Population density declined almost 3%, percent black increased 3%, owner-occupied housing increased 1%, and residential stability (i.e., the percent who lived in the same house 5 years earlier) increased nearly 2%. The exception is unemployment, which declined by about a third during this period.

indicating that places with higher levels of juvenile violence prior to 1994 experienced larger reductions in subsequent years (i.e., regression to the mean).[16]

Finally, we note that the drug sales variable had a consistently negative association with juvenile violence, though this association was not statistically significant in any of the models. Because the drug arrest indicator was not based specifically on juvenile drug arrests, it may not be the best gauge of how drug market trends impacted juvenile violence. Nevertheless, this finding may also be explained in part by the fact that, as discussed elsewhere in this report, drug arrests were related positively to trends in violence for black youth but negatively to those for white youth during the 1990s. Further, it may suggest that drug markets were becoming less violent during the 1990s, whether due to market maturation, changes in the types of drugs sold (our measure included sales of all drugs), law enforcement practices, community changes, or other factors. At the same time, this pattern may also indicate that drug enforcement by police helped to reduce juvenile violence. Although we have conceptualized the drug arrest measure primarily as a measure of drug market trends (based on other research), it also reflects changes in drug enforcement. From 1994 to 2000, drug arrests declined by 11% across the core sample of 74 cities with complete data. This decline was considerably less than the decline in violence during this period. As with the proactive policing measure, this indicates that drug enforcement increased relative to trends in violence and implies an increasing emphasis on drug enforcement during this time. To further complicate matters, if drug enforcement did produce contemporaneous reductions in juvenile violence, the estimated effect of the former on the latter may have been dampened considerably by simultaneity bias stemming from feedback effects that youth violence (particularly drug-related violence) had on drug enforcement activity by police. Given our primary intent to use the drug arrest measure to control for trends in drug markets, we do not attempt to disentangle these possibilities here.

4. DISCUSSION AND CONCLUSIONS

To conclude, this study provides evidence that police staffing and practices helped to reduce juvenile violence in urban areas during the 1990s. More specifically, results suggest that in large cities: greater numbers of police were associated with reductions in juvenile violence, particularly robbery and murder; proactive policing (i.e., order maintenance or zero tolerance policing) reduced juvenile robbery; and community policing strategies reduced juvenile murder. Hence, police resources and strategies appear to have had differential effects on different aspects of the drop in juvenile violence. These findings are consistent with a number of other studies

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[16] When modeling data expressed in mean deviations, a time-invariant measure like the pre-1994 crime rate would normally have no relationship to the dependent variable because the positive and negative mean deviation values of the dependent variable would cancel out one another for each cross-sectional unit (that is, the average of the dependent variable would be zero for each level of pre-1994 crime). Because our models used lagged predictors, however, the 1994 value of the dependent variable was not included in the estimation. Hence, cities that had higher pre-1994 levels of juvenile violence and that later experienced greater declines in juvenile violence tend to have values of the dependent variable that are more negative on average for 1996, 1998, and 2000. We also tested models in which the pre-1994 violence measure was replaced with terms that interacted pre-1994 violence with the time indicators. These models allowed the time effects to vary based on each city's level of pre-1994 violence as an alternative way of assessing the effects of pre-1994 violence (see Allison 2005). The models with these interactions had a slightly worse fit by the QICu statistic, so we elected to retain the more parsimonious models presented in the text.

suggesting that trends in police staffing and proactive policing reduced crime during the 1990s (General Accountability Office 2005; MacDonald 2002). Our results for proactive policing also affirm previous studies showing that this style of policing specifically reduces adult and juvenile robbery (Kubrin et al. 2010; MacDonald 2002; Sampson and Cohen 1988). As discussed in Chapter 5 of the Whys report, findings regarding the crime prevention benefits of community policing have been mixed. Our findings suggest, however, that agencies with a stronger community policing orientation were better at tackling youth homicide, perhaps due to having stronger community partnerships and/or problem-solving capabilities that could be focused on well-defined, priority problems. A contrary consideration is that our measure of community input to police was not associated with juvenile violence trends. However, we could not study the lagged effects of community input. Consequently, the estimated coefficient for this measure may have been biased in a positive direction by simultaneity (if, that is, police had a tendency to seek, or community members had a propensity to give, more community input in response to recent increases in juvenile violence).

The impacts of these policing trends appear to have been relatively modest as gauged by changes in the averages of the outcome and policy measures in Table 1, combined with the coefficients from model 2 in each table (the non-weighted results for the subsample of 74 agencies). Extrapolating from these figures suggests that the increase in police staffing across these cities accounted for approximately 6% to 12% of the reduction in juvenile violence (6% for total juvenile violence and juvenile murder and 12% for the combined measure of juvenile murder and robbery).[17] Similarly, the increase in community policing strategies accounted for only 4% of the drop in juvenile murder across the sample. As noted earlier, the proactive policing measure declined across the sample, but it increased relative to levels of juvenile violence. Using the ratio of DUI and disorderly conduct arrests per officer to the combined rate of juvenile murder and robbery in 1994 as a baseline suggests that DUI and disorderly conduct arrests per officer were 1.18 arrests higher than would have been expected in 2000 had these arrests declined proportionally with juvenile murder and robbery.[18] Using this figure as an estimate of the "increase" in proactive policing then suggests that proactive policing reduced the combined rate of juvenile murder and robbery by nearly 10% (the effect was likely greater for robbery and smaller for murder).

In contrast, we found little evidence that trends in adult incarceration contributed to the drop in juvenile violence. Nor did we find evidence that juvenile violence declined due to increasingly punitive juvenile justice policies, as evidenced by rates of juvenile detention and laws for transferring juveniles to adult court. If anything, these trends were associated with higher levels of juvenile violence—in other words, they worked counter to the drop in juvenile

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[17] To illustrate the impact on murder and robbery, the change in the average rate of officers per population from 1994 to 2000 was 229.83 – 208.81 = 21.02 (see Table 1). Based on model 2 from Table 2, the impact of this change on the combined rate of juvenile murder and robbery was 21.02 * -1.02 = -21.42. This amounted to 12% of the change in the combined rate of juvenile murder and robbery from 1994 to 2000 (-21.42 / (186.37 – 362.28) * 100).

[18] In 1994, the ratio of the proactive policing measure to the rate of juvenile murder and robbery was 3.59 / 362.28 = .0099 (see Table 1). If this ratio had remained constant over time, the expected value of the proactive policing measure in 2000 would have been 1.845 (i.e., 1.845 / 186.37 = .0099). The actual value of the proactive policing measure in 2000 was 3.03, a value 1.18 higher than this expected value.

violence. Findings linking juvenile waivers to higher levels of juvenile violence are also consistent with evidence discussed in Chapter 5 of the Whys report (e.g., see Redding 2010).

In sum, our findings suggest that while the juvenile crime drop was a broad and nearly universal trend in urban areas, police resources and practices contributed to the downward trend. On the other hand, increasingly punitive policies in adult corrections and the juvenile justice system did not reduce juvenile violence during this period.

Our analysis has a number of significant limitations. We focused on large urban areas, so our findings may not generalize well to other areas like rural areas, suburbs, or smaller cities. Further, although our cities were selected in a way that should make them reasonably representative of large U.S. cities, the sample was relatively small and may not be indicative of other large cities. Our measures of criminal and juvenile justice policy and practice were also limited. With respect to policing, for example, other important trends during the 1990s included the use crime mapping and "hot spots" policing and the adoption of the COMPSTAT managerial approach (see Chapter 5 of the Whys report). Likewise, there may have been important developments in the treatment and prevention of delinquency that are not represented in our data. Other limitations to our policy and control measures have been discussed throughout. Finally, our study is based on a correlational design, and the relatively short time span of the data led to high levels of collinearity. Both of these issues pose analytical challenges and make it more difficult to clearly assess causal relationships. However, our study has the virtue of having examined the impacts that criminal and juvenile justice practices had specifically on juvenile violence during the 1990s. Also, our use of fixed effects methods enabled us to control for common time trends and unmeasured, time-invariant differences among cities (our controls for autocorrelation should have also provided some additional control for unmeasured variables that may have affected trends over time). The results should be viewed cautiously but taken in context with other research they provide us with additional empirical evidence on factors contributing to the remarkable decline in juvenile violence during the 1990s.

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Appendix A: Study Cities

Table A.1: Full Sample of 97 Cities

Birmingham, AL	Denver, CO	Rochester, NY
Mobile, AL	Waterbury, CT	Syracuse, NY
Montgomery, AL	Savannah, GA	Toledo, OH
Huntsville, AL	Atlanta, GA	Dayton, OH
Little Rock, AR	Honolulu, HI	Cincinnati, OH
Glendale, AZ	Boise, ID	Columbus, OH
Mesa, AZ	Ft Wayne, IN	Oklahoma City, OK
Tucson, AZ	Evansville, IN	Tulsa, OK
Fremont, CA	Indianapolis, IN	Portland, OR
Hayward, CA	Louisville, KY	Erie, PA
Oakland, CA	Baton Rouge, LA	Philadelphia, PA
Fresno, CA	Springfield, MA	Nashville, TN
Glendale, CA	Boston, MA	Chattanooga, TN
Long Beach, CA	Worcester, MA	Knoxville, TN
Los Angeles, CA	Baltimore, MD	Irving, TX
Pasadena, CA	Flint, MI	Pasadena, TX
Torrance, CA	Sterling Heights, MI	Lubbock, TX
Fullerton, CA	Warren, MI	Waco, TX
Garden Grove, CA	Ann Arbor, MI	Corpus Christi, TX
Huntington Beach, CA	Detroit, MI	Arlington, TX
Orange, CA	Minneapolis, MN	Fort Worth, TX
Riverside, CA	St Paul, MN	Abilene, TX
Sacramento, CA	Springfield, MO	Austin, TX
Ontario, CA	St Louis, MO	Houston, TX
San Diego, CA	Jackson, MS	Chesapeake, VA
San Francisco, CA	Lincoln, NE	Newport News, VA
Stockton, CA	Durham, NC	Norfolk, VA
San Jose, CA	Winston Salem, NC	Richmond, VA
Modesto, CA	Raleigh, NC	Virginia Beach, VA
Oxnard, CA	Elizabeth, NJ	Tacoma, WA
Aurora, CO	Newark, NJ	Spokane, WA
Colorado Springs, CO	Las Vegas, NV	
Lakewood, CO	Buffalo, NY	

Table A.2: Subsample of 74 Cities with Complete Data

Little Rock, AR	Worcester, MA
Glendale, AZ	Baltimore, MD
Mesa, AZ	Flint, MI
Tucson, AZ	Sterling Heights, MI
Fremont, CA	Warren, MI
Hayward, CA	Detroit, MI
Oakland, CA	St Paul, MN
Fresno, CA	Springfield, MO
Glendale, CA	St Louis, MO
Long Beach, CA	Durham, NC
Los Angeles, CA	Winston Salem, NC
Pasadena, CA	Raleigh, NC
Torrance, CA	Elizabeth, NJ
Fullerton, CA	Newark, NJ
Garden Grove, CA	Las Vegas, NV
Huntington Beach, CA	Buffalo, NY
Orange, CA	Rochester, NY
Riverside, CA	Syracuse, NY
Sacramento, CA	Toledo, OH
Ontario, CA	Dayton, OH
San Diego, CA	Columbus, OH
San Francisco, CA	Oklahoma City, OK
Stockton, CA	Tulsa, OK
San Jose, CA	Portland, OR
Modesto, CA	Philadelphia, PA
Oxnard, CA	Knoxville, TN
Lakewood, CO	Irving, TX
Waterbury, CT	Pasadena, TX
Savannah, GA	Lubbock, TX
Atlanta, GA	Waco, TX
Honolulu, HI	Corpus Christi, TX
Ft Wayne, IN	Arlington, TX
Evansville, IN	Forth Worth, TX
Indianapolis, IN	Abilene, TX
Louisville, KY	Tacoma, WA
Baton Rouge, LA	Spokane, WA
Springfield, MA	
Boston, MA	

Appendix B: Community Policing Tactics and Community Input Scale Items

Tactics scale:[19]

1. Regular community meetings to discuss crime
2. Surveys of citizens to determine general community needs and satisfaction with your agency
3. Citizen action/advisory councils in precincts or districts
4. Citizen/police academy
5. Clean up/fix up projects with community residents
6. Joint projects with community residents to reduce disorder such as loitering, public drinking, etc.
7. Joint community crime prevention program Neighborhood Watch
8. Joint projects with local businesses to reduce disorder or petty crime
9. Analyzing crime patterns using a computerized geographic information system (such as crime mapping).
10. Officers analyze and use crime data to identify recurring patterns of crime and disorder on their beats.
11. Officers analyze and use community residents' comments to identify recurring patterns of crime and disorder on their beats.
12. Designating certain recurring patterns as "problems" or "projects" requiring nontraditional responses.
13. Analyzing problems or projects with business or property owners, school principals, or property managers or occupants.
14. Analyzing problems or projects with probation/parole officers or others who monitor offenders.
15. Considering neighborhood values in creating solutions or planning projects
16. Using agency data to measure the effects of responses to problems
17. Documenting problems, projects, analyses, responses, failures, and successes in writing
18. Making sure that solved problems stay solved
19. Officers assigned to varying styles of preventive patrol
20. Officers assigned to policy/youth programs.
21. Officers assigned to drug education programs in schools.
22. Officers assigned to late-night recreation programs
23. Agency encourages use of alcohol, housing, or other code enforcement to combat crime and disorder
24. Agency encourages use of mediation to resolve disputes and conflicts.
25. Agency encourages use of confidential hotlines for reporting illegal drugs or guns.
26. Agency encourages use of cooperative programs with schools to reduce truancy
27. Law enforcement agency participation in graffiti eradication programs
28. Law enforcement agency participation in victim assistance programs
29. Law enforcement agency participation in battered women's programs
30. Revised mission, vision, or values statements to emphasize community voice, officer discretion, or both

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[19] Each item is a binary indicator for whether or not the tactic was present in a given year (1=present, 0=absent). Values for each item were added together for the full scale value.

31. Beat or patrol boundaries that coincide with neighborhood/community boundaries
32. Beat or patrol boundaries that coincide with other city agencies' administrative boundaries
33. Dispatch rules structured to maximize officers' time preventing crimes on their beats
34. Team approach instead of chain of command for prevention, problem-solving, and law enforcement
35. Revised employee evaluation measures for officers doing community policing
36. Alternative response methods for calls
37. Joint crime/violence reduction task force involving multiple agency heads

Community input scale:[20]

1. How often are constructive suggestions made?
2. How often does the community organization present useful ideas?
3. How often does the community organization give specific crime information?
4. How often does the community organization help in operations?
5. How often does the community devote resources or time to crime prevention?

How often does the community use influence in their neighborhoods to pave the way for police initiatives?

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[20] The responses for each question were frequently (2), occasionally (1), and almost never (0). The community input scale was constructed by adding the values of each response.