Misdemeanor Policing, Physical Disorder, and Gun-related Homicide

A Spatial Analytic Test of "Broken-Windows" Theory

Magdalena Cerda, Melissa Tracy, Steven F. Messner, David Vlahov, Kenneth Tardiff, and Sandro Galea

Background: Homicide contributes substantially to the burden of death in the US and remains a key contributor to the gap in white-black life expectancy. It has been hypothesized that "broken-windows" policing is associated with lower homicide rates and that physical disorder may mediate this association. However, the empirical evidence is limited and conflicting.

Methods: We used pooled, cross-sectional time-series data for 74 New York City (NYC) Police Precincts between 1990 and 1999 to test the relation between neighborhood misdemeanor policing (an indicator of physical order) and homicide in NYC in the 1990s. We applied Bayesian hierarchical models, including a random effect of place, to account for serial correlations in homicide across adjacent neighborhoods.

Results: An increase of 5000 misdemeanor arrests in a precinct with 100,000 people was associated with a reduction of 3.5 homicides (95% credible interval = −5.00 to −1.00). However, increased misdemeanor arrests were associated with lower physical order (posterior median = −0.015 [−0.025 to −0.011]), and physical order was unrelated to homicide.

Conclusions: Our study replicated prior findings suggesting that misdemeanor policing reduces homicide rates, but offered no support for the hypothesis that physical disorder is a mediator of the impact of such policing. Factors responsible for the dramatic decline in US homicides in the last decade remain unclear.

(Epidemiology 2009;20: 533–541)
Cerdá et al

Epidemiology • Volume 20, Number 4, July 2009

feld et al\textsuperscript{12} employed a more reliable measure of policing, controlling for the influence of citizen complaints of disorder on the police response, and spatial lags in policing and homicide/robbery. Both studies found that misdemeanor policing had a small effect on homicide rates.

Although both of these papers made important contributions to the literature, neither reported evidence that a reduction in neighborhood disorder was the mechanism by which changes in misdemeanor policing led to the homicide decline. Messner et al\textsuperscript{15} did not take into account physical disorder or spatial effects. Rosenfeld et al\textsuperscript{12} considered a different question: they were interested in investigating disorder or spatial effects. Rosenfeld et al\textsuperscript{12} employed a more reliable measure of policing, controlling for the influence of citizen complaints of disorder on the police response, and spatial lags in policing and homicide/robbery. Both studies found that misdemeanor policing had a small effect on homicide rates.

The relation between disorder and crime is also the subject of some debate. Although 2 cross-sectional studies\textsuperscript{16,17} showed a positive correlation between disorder and crime, subsequent longitudinal studies have failed to find an association, particularly once levels of concentrated poverty and collective efficacy were controlled.\textsuperscript{18–20} It has been argued that disorder and crime have shared origins, but no causal connection to each other.\textsuperscript{19} Moreover, recent research has failed to find support for one of the key underlying assumptions of broken-windows theory—that in order for disorder to cause an increase in crime, disorder and crime must be conceptually and empirically distinct.\textsuperscript{21}

In this study, we build on previous work on the broken-windows theory. We explore the process through which policing affects homicide, by testing whether misdemeanor policing leads to a decrease in physical signs of disorder (which would be expected if such policing revitalizes neighborhoods) and whether lower levels of disorder, in turn, lead to lower rates of homicide. Figure 1 presents a conceptual diagram of the associations investigated.

METHODS

Data for this study were collected from 5 sources: the Office of the Chief Medical Examiner of New York City, the NYC Police Department, the NYC Human Resources Administration, the NYC Mayor’s Management Office, and the United States Census Bureau. The units of analysis were the 74 NYC police precincts, in all 5 NYC boroughs. We considered precincts to be the most appropriate unit of analysis to study the impact of broken-windows policing because law enforcement is organized at the precinct level.\textsuperscript{22} Precincts 33 and 34 were treated as one precinct because they were split beginning in 1994, whereas precinct 22 was excluded because no one resides in this precinct.

Homicide

The homicide measure of interest was gun-related homicide rates. We focus on gun-related homicides because (1) previous research has demonstrated distinct trends for gun versus nongun homicide in NYC and (2) the overall trend for gun-related homicide is more compatible with theoretical claims about an impact of broken-windows policing.\textsuperscript{9} All cases of homicides in NYC from 1990 to 1999 were identified through standardized manual review and abstraction of medical files in the Office of the Chief Medical Examiner of New York City. These cases were geocoded to the precinct level by address of injury using ArcGIS software, version 9.0 (ESRI, Redlands, CA). Details regarding these data have been previously published.\textsuperscript{15} Only cases with a valid address of injury were included in the analysis.

Homicide rates were calculated per 100,000 population. We estimated the total population in each precinct in each year using a linear interpolation for the years between Census population estimates of 1990 and 2000.

Main Exposures of Interest

Misdemeanor Policing

Data were collected from the NYPD by precinct from 1990 through 1999 to represent broken-windows oriented policing.\textsuperscript{6,8,13,15} and expressed as rates per 100,000 population (derived as described earlier).

Potential Confounders

The control variables included a wide range of sociodemographic characteristics of precincts that have been linked with homicide rates in past macro-level research.\textsuperscript{25} With the exception of the measure of public assistance, data for these variables were available only for decennial years, and thus we measured them as time invariant, fixed at the 1990 Census year, using data from the US Census Summary.
File 3. Infoshare online (www.infoshare.org) was our source for Census data at the tract level, which were aggregated to the precinct level. The measures included: percent male, percent under age 35, percent black, percent Hispanic, percent foreign-born, percent unemployed, and concentrated poverty. This last variable was a composite score created with principal components analysis by summing the percent of persons living below 200% poverty, the percent with less than a high school education, the percent of female-headed households, and the percent receiving public assistance—each weighted by its factor loading on the first principal component, which accounted for 90% of the variance. The components of the composite score had been standardized before conducting the principal components analysis to prevent those variables with large variance from dominating the solution. Higher scores of the composite score indicated greater levels of concentrated poverty. We also standardized all time-invariant control variables to have a mean of 0 and a standard deviation of 1, to improve convergence.

In addition to the indicators of sociodemographic characteristics of precincts, controls were included for 6 other variables available on an annual basis. Public assistance (obtained from the Human Resources Administration), was selected as a measure of time-varying neighborhood disadvantage; it has been previously shown to correlate highly with other indicators of disadvantage.26–29 Felony arrest rates per 100,000 people were previously shown to correlate highly with other indicators of disadvantage.26–29 Felony arrest rates per 100,000 people were collected from the NYC Police Department by police precinct from 1990 through 1999; these rates were included to control for police activity not related to broken-windows policing. The indicator of manpower was the number of police officers assigned to each police precinct from 1990 through 1999 by the Police Department. The level of cocaine use in each precinct was measured as the percent of accident decedents whose toxicology results were positive for cocaine that occurred in each precinct in each year 1990–1999, recorded from the Medical Examiner’s data. The proxy for firearm availability was the annual percent of suicide deaths where guns were used, per precinct, recorded from Medical Examiner’s data. This measure is a valid proxy for firearm availability in that it correlates highly with survey-based measures of firearms.30 Finally, we included a measure of the incarceration rate per 100,000 population, operationalized as the number of prison admissions by precinct-of-arrest from 1990 through 1999, and obtained from the New York State Division of Criminal Justice Services.

**Statistical Analyses**

All analyses were based on “change” Bayesian hierarchical models, commonly used in disease mapping.31,32 Models were of the following form:

\[ \Delta Y_{it} = \alpha_i + \beta_1 \Delta x_{arrest_i} + \beta_2 \Delta x_{publicassist_i} + \beta_3 \Delta x_{order_i} + \beta_4 X + \lambda_i \]

\[ \lambda_i \sim \text{CARNormal} (W, \tau_\lambda) \]

where \( \Delta Y_{it} \) was the change in the homicide rate between times \( t \) and \( t+1 \) for the precinct \( i \) for time period \( t \), \( \Delta x_{arrest_i} \) was the change in the misdemeanor arrest rate between times \( t \) and \( t+1 \), \( \Delta x_{publicassist_i} \) was the change in proportion of residents receiving public assistance, \( \Delta x_{order_i} \) was the change in the rate of sidewalk order, \( X \) was a set of baseline covariates, and \( \lambda_i \) was the random spatially-structured effect.33 We used spatial error models to account for the spatial dependence of risk for homicide in nearby areas. The spatial random effect was modeled with a prior that has a conditionally autoregressive distribution (CAR), with weights for first-order adjacent neighbors set at 1 (“neighbors” defined as precincts sharing a border).34 All models were estimated with Winbugs with 2 parallel Markov chain Monte Carlo chains. We computed posterior medians and 95% credible intervals. Details about these spatial models are provided in eAppendix 2 (http://links.lww.com/A985).

First, we examined the predictors of neighborhood physical order to assess the initial link in the process relating misdemeanor policing to homicide. Models were constructed using the misdemeanor arrest rate alone as a predictor, then adding public assistance and then introducing a full set of baseline control variables. We then examined the predictors of neighborhood homicide rates. Models began with the misdemeanor arrest rate alone as a predictor. We then added neighborhood physical order, and then public assistance. Each of these 3 models was repeated, including the full set of baseline control variables. Finally, we constructed a model with misdemeanor arrests, physical order, public assistance, and baseline covariates, plus a set of measures of alternative explanations for the homicide drop (an indicator of cocaine use, a measure of firearm availability, and a measure of the incarceration rate). These models estimated the contemporaneous association between change in the predictors and change in homicide. We also conducted a sensitivity analysis, whereby 1-year lagged change in the predictor variables (except for disorder, as it was posed as a mediator), was associated with change in homicide.

**RESULTS**

Of 14,186 homicides that occurred in New York City between 1990 and 1999, 2027 (14%) were missing precipit-of-injury information, and thus were excluded from our analyses. This left a total of 12,159 homicides classified by precipit of injury. Women and those of any race other than black were more likely to be missing precipit-of-injury information. Of these, 8820 (73%) were firearm-related and were thus used in the analysis. Homicide counts geocoded by precinct of injury. Women and those of any race other than black were more likely to be missing precipit-of-injury information. Of these, 8820 (73%) were firearm-related and were thus used in the analysis. Homicide counts geocoded by precinct based on data from the Medical Examiner correlated between 0.85 and 0.95 (depending on the year) with homicide counts from the NY Police Department.

Table 1 presents the demographic characteristics of all precincts, and precincts stratified by gun-related homicide
Precincts with low homicide rates had lower levels of misdemeanor arrests (3087 vs. 6311 arrests per 100,000 population) and a higher concentration of clean sidewalks (87% vs. 73%) than precincts with high homicide rates. The lower risk precincts also had lower rates of public assistance receipt (7% vs. 19% of the population), lower concentrations of blacks and Hispanics, and higher concentrations of police force in the precinct.

Figure 2 presents the spatial distribution of homicide in New York City in the 1990s, averaged across 5-year spans. There were systematic differences across precincts, and these spatial patterns changed over time. This was confirmed by an analysis of univariate local indicators of spatial association (LISA statistics), which showed neighborhood clusters of homicide in the first and second half of the decade. Global Moran’s I statistics for each 5-year span were higher than the −0.0137 expected for 74 precincts (0.41 in 1990–1994 and 0.38 in 1995–1999).

Predictors of annual change in levels of physical order are given in Table 2. For ease of interpretation, the metric of changes in misdemeanor arrests is expressed in units of 5000 arrests for all models. Model 1 presents the bivariate association between change in the rate of misdemeanor arrests and change in the proportion of clean sidewalks in the precinct. This model showed a weak negative association between policing and the proportion of clean sidewalks: an increase of 5000 misdemeanor arrests in a neighborhood of 100,000 people was associated with a 0.015-unit decrease (95% cred-

---


<table>
<thead>
<tr>
<th>Level of Gun-related Homicides</th>
<th>Total (n = 74)</th>
<th>Low (n = 36)</th>
<th>High (n = 38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total gun-related homicide rate (per 100,000 population)</td>
<td>13.9 (16.2)</td>
<td>4.6 (4.6)</td>
<td>22.6 (18.3)</td>
</tr>
<tr>
<td>Exposures of interest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misdemeanor arrest rate (per 100,000 population)</td>
<td>4748 (5075)</td>
<td>3088 (4540)</td>
<td>6312 (5061)</td>
</tr>
<tr>
<td>Percent acceptably clean sidewalks</td>
<td>80 (13)</td>
<td>87 (9)</td>
<td>73 (13)</td>
</tr>
<tr>
<td>Percent receiving public assistance</td>
<td>13 (10)</td>
<td>7 (4)</td>
<td>19 (10)</td>
</tr>
<tr>
<td>Control variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent male</td>
<td>47 (2.3)</td>
<td>48 (1.8)</td>
<td>46 (2.6)</td>
</tr>
<tr>
<td>Percent age &lt;35 years</td>
<td>52 (7.6)</td>
<td>48 (5.2)</td>
<td>56 (7.5)</td>
</tr>
<tr>
<td>Percent black</td>
<td>27 (27)</td>
<td>12 (16)</td>
<td>42 (29)</td>
</tr>
<tr>
<td>Percent Hispanic</td>
<td>24 (18)</td>
<td>17 (11)</td>
<td>30 (21)</td>
</tr>
<tr>
<td>Percent foreign-born</td>
<td>26 (12)</td>
<td>28 (12)</td>
<td>24 (13)</td>
</tr>
<tr>
<td>Percent unemployed</td>
<td>4.5 (1.2)</td>
<td>3.8 (0.8)</td>
<td>5.2 (1.0)</td>
</tr>
<tr>
<td>Concentrated poverty</td>
<td>91 (42)</td>
<td>65 (23)</td>
<td>116 (41)</td>
</tr>
<tr>
<td>Felony arrest rate (per 100,000 population)</td>
<td>2449 (2168)</td>
<td>1321 (1514)</td>
<td>3510 (2156)</td>
</tr>
<tr>
<td>Size of police force</td>
<td>220 (61)</td>
<td>199 (52)</td>
<td>239 (62)</td>
</tr>
<tr>
<td>Proportion of accident decedents positive for cocaine toxicology</td>
<td>8.3 (10.7)</td>
<td>5.5 (7.3)</td>
<td>10.9 (12.5)</td>
</tr>
<tr>
<td>Proportion of suicide deaths caused by firearms</td>
<td>19 (21)</td>
<td>18 (20)</td>
<td>20 (22)</td>
</tr>
<tr>
<td>Incarceration rate (per 100,000 population)</td>
<td>305 (414)</td>
<td>136 (146)</td>
<td>464 (511)</td>
</tr>
</tbody>
</table>

*aPolice precincts with total gun-related homicide rates at or below the median were classified as having low levels of homicide, whereas police precincts with total gun-related homicide rates above the median were classified as having high levels of homicide.


*cMeasures available each year, 1990–1998.

*dMeasures available at one point in time (1990).

*eConcentrated poverty includes the following socioeconomic characteristics aggregated to the police precinct level: percent less than high school education, percent less than 200% poverty, percent female-headed households, and percent receiving public assistance; higher scores indicate higher levels of concentrated poverty.

---

536 | www.epidem.com © 2009 Lippincott Williams & Wilkins
TABLE 2. Bayesian Hierarchical Models, Including a Space Random Effect, Predicting Change in Neighborhood Physical Order (Percent of Acceptably Clean Sidewalks), NYC Police Precincts, 1990–1999a

<table>
<thead>
<tr>
<th></th>
<th>Model 1 Posterior Median (95% Credible Interval)</th>
<th>Model 2 Posterior Median (95% Credible Interval)</th>
<th>Model 3 Posterior Median (95% Credible Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposures of interest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in misdemeanor arrest rate (per 5000 arrests)b</td>
<td>−0.015 (−0.025 to −0.01)</td>
<td>−0.015 (0.000 to −0.025)</td>
<td>−0.015 (−0.025 to −0.01)</td>
</tr>
<tr>
<td>Change in percent receiving public assistancec</td>
<td>−0.05 (−0.17 to 0.06)</td>
<td>−0.02 (−0.13 to 0.10)</td>
<td></td>
</tr>
<tr>
<td>Control variables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent maled</td>
<td>−0.0006 (−0.004 to 0.005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent age &lt;35 yearsd</td>
<td>0.000 (−0.008 to 0.008)</td>
<td>0.001 (−0.006 to 0.009)</td>
<td>0.002 (−0.004 to 0.009)</td>
</tr>
<tr>
<td>Percent blackd</td>
<td>0.000 (−0.008 to 0.009)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Hispanicd</td>
<td>0.001 (−0.005 to 0.003)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent foreign-born</td>
<td>0.000 (−0.008 to 0.009)</td>
<td>0.000 (−0.008 to 0.009)</td>
<td>0.000 (−0.008 to 0.009)</td>
</tr>
<tr>
<td>Percent unemployedd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentrated povertyd,e</td>
<td>0.009 (−0.0004 to 0.02)</td>
<td>0.000 (−0.0004 to 0.02)</td>
<td>0.000 (−0.0004 to 0.02)</td>
</tr>
<tr>
<td>Change in felony arrest rateb</td>
<td>0.000 (0.000 to 0.000)</td>
<td>0.000 (0.000 to 0.000)</td>
<td>0.000 (0.000 to 0.000)</td>
</tr>
<tr>
<td>Change in manpowerf</td>
<td>0.000 (0.000 to 0.000)</td>
<td>0.000 (0.000 to 0.000)</td>
<td>0.000 (0.000 to 0.000)</td>
</tr>
<tr>
<td>Standard deviation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total standard deviation (square root of 1/τ)</td>
<td>0.04 (0.04 to 0.04)</td>
<td>0.04 (0.04 to 0.04)</td>
<td>0.04 (0.04 to 0.04)</td>
</tr>
<tr>
<td>Spatial standard deviation (square root of 1/τs)</td>
<td>0.01 (0.01 to 0.02)</td>
<td>0.01 (0.01 to 0.02)</td>
<td>0.01 (0.01 to 0.01)</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.02 (0.02 to 0.02)</td>
<td>0.01 (0.01 to 0.02)</td>
<td>0.02 (0.01 to 0.02)</td>
</tr>
</tbody>
</table>

aModels based on 50,000–100,000 iterations (10,000 samples).
bMisdemeanor and felony arrest rates were expressed per 100,000 population before calculating annual change.
cPercent receiving public assistance in 1990 at the police precinct level was approximated from the community district level; 1993 public assistance data are a linear interpolation between 1992 and 1994 data.
d1990 census variables were standardized to have mean of 0 and standard deviation of 1.
eAs defined in Table 1 footnote.
fAnnual change in size of police force in precinct.

TABLE 3. Bayesian Hierarchical Models, Including Space Random Effect, Predicting Change in Total Gun-related Homicide Rate, NYC Police Precincts, 1990–1999a

<table>
<thead>
<tr>
<th></th>
<th>Model 1 Posterior Median (95% Credible Interval)</th>
<th>Model 2 Posterior Median (95% Credible Interval)</th>
<th>Model 3 Posterior Median (95% Credible Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposures of interest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in misdemeanor arrest rate (per 5000 arrests)b</td>
<td>−4.5 (−5.0 to −2.0)</td>
<td>−4.5 (−5.0 to −2.0)</td>
<td>−4.5 (−5.0 to −1.5)</td>
</tr>
<tr>
<td>Change in percent acceptably clean sidewalksd</td>
<td>2.2 (−13 to 18)</td>
<td>0.76 (−15 to 16)</td>
<td>−35 (−58 to −11.9)</td>
</tr>
<tr>
<td>Change in percent receiving public assistanced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard deviation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total standard deviation (square root of 1/τ)</td>
<td>10 (7 to 10)</td>
<td>10 (7 to 10)</td>
<td>10 (7 to 10)</td>
</tr>
<tr>
<td>Spatial standard deviation (square root of 1/τs)</td>
<td>0.04 (0.01 to 0.44)</td>
<td>0.04 (0.01 to 0.50)</td>
<td>0.04 (0.01 to 0.59)</td>
</tr>
<tr>
<td>Intercept</td>
<td>−2.01 (−2.62 to −1.39)</td>
<td>−2.04 (−2.7 to −1.37)</td>
<td>−2.39 (−3.11 to −1.67)</td>
</tr>
</tbody>
</table>

aModels based on iterations 50,000–100,000 (10,000 samples).
bMisdemeanor and felony arrest rates were expressed per 100,000 population before calculating annual change.
cPercent receiving public assistance in 1990 at the police precinct level was approximated from the community district level; 1993 public assistance data are a linear interpolation between 1992 and 1994 data.
d1990 census variables were standardized to have mean of 0 and standard deviation of 1.
© 2009 Lippincott Williams & Wilkins www.epidem.com | 537
change in sidewalk cleanliness as an additional predictor; this
was not associated with the rate of homicide. Finally, Model 3
also included annual change in public assistance receipt,
which was a negative predictor of homicide (posterior me-
dian: −35 [95% credible interval = −58 to −12]). Controlling
for public assistance did not change the association
between policing and homicide.

Table 4 presents the same models as Table 3, control-
ning for a set of baseline structural characteristics and then for
a set of alternative potential predictors of the homicide drop.
The association between annual change in misdemeanor ar-
est and change in homicide remained negative (Model 1)
and the association between sidewalk cleanliness and homi-
cide remained null (Model 2), regardless of the covariates
included in the models. In contrast with the negative effect of
misdemeanor policing, felony arrest rates were not an impor-

| TABLE 4. Bayesian Hierarchical Models, Including Space Random Effect, Predicting Change in Total Gun-related Homicide Rate, Including Control Variables, NYC Police Precincts, 1990–1999* |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Exposures of interest           | Model 1 Posterior Median        | Model 2 Posterior Median        | Model 3 Posterior Median        | Model 4 Posterior Median        |
|                                 | (95% Credible Interval)         | (95% Credible Interval)         | (95% Credible Interval)         | (95% Credible Interval)         |
| Change in misdemeanor arrest    | −3.5 (−5.0 to −1.0)             | −3.5 (−5.0 to −1.0)             | −3.0 (−5.0 to −0.3)             | −3.5 (−5.0 to −1.0)             |
| rate (per 5000 arrests)*        |                                 |                                 |                                 |                                 |
| Change in percent acceptably    | 10 (−6 to 26)                   | 9 (−6 to 25)                    | 9 (−6 to 25)                    |                                 |
| clean sidewalks*                |                                 |                                 |                                 |                                 |
| Change in percent receiving     | −47.05 (−70.36 to −23.51)       | −45.35 (−68.36 to −21.25)       |                                 |                                 |
| public assistance*              |                                 |                                 |                                 |                                 |
| Control variables               |                                 |                                 |                                 |                                 |
| Percent male*                   | −0.26 (−1.01 to 0.50)           | −0.27 (−1.02 to 0.47)           | −0.35 (−1.08 to 0.39)           | −0.35 (−1.08 to 0.41)           |
| Percent age <35 years*          | −0.37 (−1.88 to 1.11)           | −0.42 (−1.90 to 1.06)           | −0.31 (−1.82 to 1.17)           | −0.32 (−1.79 to 1.16)           |
| Percent black*                  | −0.53 (−1.92 to 0.87)           | −0.46 (−1.88 to 0.89)           | −0.52 (−1.90 to 0.87)           | −0.55 (−1.91 to 0.83)           |
| Percent Hispanic*               | −0.08 (−1.58 to 1.39)           | −0.005 (−1.47 to 1.44)          | −0.03 (−1.48 to 1.46)           | −0.05 (−1.49 to 1.37)           |
| Percent foreign-born*           | 0.22 (−0.48 to 0.93)            | 0.22 (−0.49 to 0.93)            | 0.31 (−0.42 to 1.02)            | 0.29 (−0.41 to 0.99)            |
| Percent unemployed*             | −0.13 (−1.70 to 1.44)           | −0.19 (−1.76 to 1.37)           | −0.16 (−1.72 to 1.391)          | −0.06 (−1.61 to 1.45)           |
| Concentrated poverty*           | −0.64 (−2.20 to 0.89)           | −0.71 (−2.29 to 0.87)           | −1.06 (−2.61 to 0.47)           | −1.13 (−2.65 to 0.41)           |
| Change in felony arrest rate*   | −0.001 (−0.002 to 0.000)        | −0.001 (−0.002 to 0.000)        | −0.001 (−0.002 to 0.000)        | −0.001 (−0.003 to 0.000)        |
| Change in incarceration rate*   | 0.01 (−0.03 to 0.05)            | 0.01 (−0.02 to 0.05)            | −0.002 (−0.04 to 0.04)          | −0.003 (−0.04 to 0.04)          |
| Change in cocaine use*          |                                 | 0.07 (0.02 to 0.12)             |                                 |                                 |
| Change in firearm availability* |                                 | 0.01 (−0.01 to 0.04)            |                                 |                                 |
| Change in incarceration rate*   |                                 | 0.002 (−0.01 to 0.01)           |                                 |                                 |
| Standard deviation              |                                 |                                 |                                 |                                 |
| Total standard deviation        | 10 (7.07 to 10)                 | 10 (7.07 to 10)                 | 7.07 (7.07 to 10)               | 7.07 (7.07 to 10)               |
| (square root of 1/τ)            |                                 |                                 |                                 |                                 |
| Spatial standard deviation      | 0.04 (0.01 to 0.39)             | 0.04 (0.01 to 0.42)             | 0.04 (0.01 to 0.40)             | 0.04 (0.01 to 0.39)             |
| (square root of 1/τx)           |                                 |                                 |                                 |                                 |
| Intercept                      | −2.21 (−2.87 to −1.56)          | −2.37 (−3.10 to −1.67)          | −2.78 (−3.51 to −2.07)          | −2.69 (−3.41 to −1.96)          |

* Models based on 50,000–100,000 iterations (10,000 samples).
* Misdemeanor arrest, felony arrest, and incarceration rates were expressed per 100,000 population before calculating annual change.
* Percent acceptably clean sidewalks at the police precinct level was approximated from the community district level.
* Percent receiving public assistance in 1990 at the police precinct level was approximated from the community district level; 1993 public assistance data are a linear interpolation between 1992 and 1994 data.
* 1990 Census variables were standardized to have mean of 0 and standard deviation of 1.
* Concentrated poverty includes the following socioeconomic variables aggregated to the police precinct level: percent less than high school education, percent less than 200% poverty, percent female-headed households, and percent receiving public assistance; higher scores indicate higher levels of concentrated poverty.
* Annual change in size of police force in precinct.
* Annual change in percent accident decedents with positive cocaine toxicology.
* Annual change in percent suicides where guns were used.
tient predictor of gun-related homicides. The magnitude of the association between change in receipt of public assistance and change in homicide became stronger (Model 3 in Table 4 vs. Model 3 in Table 3). Incorporating alternative predictors of the homicide decline (Model 4) did not have an impact on the association between the predictors of interest and homicide. Increased levels of misdemeanor arrests remained associated with decreases in homicide (~3.5 per 5000 misdemeanor arrests [-5.0 to -1.0]). However, change in the cocaine drug markets, measured as the percent of accident decedents whose toxicology results were positive for cocaine, was a positive predictor of homicide (posterior median: 0.07 [95% credible interval = 0.02 to 0.12]). Regardless of the number of covariates introduced, the models consistently indicated minimal spatial autocorrelation (Model 4: posterior median = 0.04 [95% credible interval = 0.01 to 0.39]).

A sensitivity analysis of Model 4 was conducted, with 1-year lags imposed for all time-varying covariates except for disorder (model not shown). Lagged change in misdemeanor arrests and in cocaine consumption were not associated with change in the homicide rate, suggesting no late-emerging effects from changes in these variables.

**DISCUSSION**

This study re-examines one of the leading explanations for the decline in homicide in New York City in the 1990s, the namely broken-windows hypothesis. Our analyses are based on pooled, cross-sectional time-series data for 74 NYC police precincts from 1990 through 1999. The results of the marginal Bayesian regression models reaffirm the key findings from recent papers on the homicide drop in NYC:12,15,35 an increase in misdemeanor arrests over the 1990s made a small contribution to the reduction in homicide rates, while change in cocaine consumption also had an impact. The study provides further evidence that changes in policing and drug market activity may have contributed (along with other factors) to the dramatic homicide decline in NYC in the 1990s.

Policing increased in certain precincts between 1994 and 1996, as part of a concerted effort to reduce “public disorder” that is thought to encourage crime.36 This effort went beyond the usual response to prior crime: when William J. Bratton became NYC Police Commissioner, he advocated “strict enforcement of laws against quality-of-life offenses such as subway turnstile jumping, aggressive panhandling, drinking and being drunk in public, and soliciting prostitutes.”37 The increase in misdemeanor policing coincided with this new policy: more than twice as many nonfelony arrests were made in 1998 as in 1989, while the number of felony arrests declined in the same period.15 The increase in misdemeanor policing was thus part of a deliberate policy intervention.

A key element of the broken-windows hypothesis—that misdemeanor policing reduces homicides through a decrease in physical disorder—is not supported in our analyses. An increase in misdemeanor policing was actually associated with an increase in physical disorder. However, this physical disorder had no association with homicide. The lack of an association between disorder and homicide should be interpreted with caution, however, as we used a proxy measure of disorder, which is subject to estimation error.

The anomalous negative association between misdemeanor policing and physical order observed here suggests a possible reverse causal relationship. Neighborhoods with lower levels of physical order may generate demand for more misdemeanor policing. Consistent with this interpretation, Rosenfeld et al.12 found that disorder, measured as citizen complaints of misdemeanor and ordinance violations, predicted higher levels of policing. However, if this process is in fact operating, it is inconsistent with theoretical arguments predicated on the premise that physical disorder goes hand-in-hand with the abandonment of neighborhoods. Citizen complaints to the police would seem to be more likely when residents are mobilized on behalf of the neighborhood. Note also that, whatever the association between physical disorder and misdemeanor policing, the null relationship between physical disorder and homicide gives no support to the hypothesized mediating effect.

Also unexpected, public assistance was associated with lower levels of homicide. The public assistance measure, which is independent of initial levels of deprivation captured in the composite index of concentrated poverty, may reflect benefits of extending the social safety net to additional segments of the population. Prior research at the subnational and national level has suggested that more generous and expansive social welfare policies reduce stressors in the environment and strengthen institutional controls, thereby reducing levels of lethal violence.38–40

There are some questions about the robustness of these associations in our data. The association between misdemeanor policing and homicide, and between cocaine consumption and homicide, proved to be sensitive to the specification of the temporal process. The results reported earlier assume simultaneous effects of changes in policing and cocaine consumption on changes in homicide. A sensitivity analysis was also conducted, wherein changes in policing and cocaine consumption were measured with 1-year lags. The associations disappeared in the lagged models.

Nonexperimental designs suffer from potential endogeneity and unobserved confounding. We addressed concerns about the rate of misdemeanor arrests reflecting a response to underlying levels of violence by including controls for levels of police manpower and felony arrests. However, we cannot conclusively differentiate the impact of misdemeanor policing from other policing practices, or from correlated measures of changes in social conditions. For example, prior neighborhood research has identified “collective efficacy” as an important predictor of levels of crime that presumably operates primarily through
enhanced informal social control. It is plausible to speculate that collective efficacy might also affect formal control—residents of mobilized neighborhoods might be better able to secure more vigorous policing. If such processes operate, they may generate a spurious association between changes in misdemeanor arrests and changes in homicide. It is also possible, however, that increased misdemeanor policing might promote greater collective efficacy, thereby yielding an indirect effect of policing on homicide in addition to any direct effect. Future studies need to explore the contribution of this particular neighborhood characteristic and other potential confounders on the association between policing and homicide.

The analysis is also constrained by the available data. For Census-based measures, we were restricted to estimating effects of precinct characteristics in 1990 with annual rates of change in homicide over the next decade. Elapsed time between 1990 and later years weakens the power of the control variables to deal with unobserved heterogeneity. We are unable to estimate, for example, how changing age and sex structure of the population may have affected the relationship between our covariates of interest and gun-related homicides. We are also restricted to using public assistance as a measure of economic disadvantage, which may have limited our ability to control for the impact that other dimensions of disadvantage, separate from welfare receipt, had on homicide.

Violent crime is one of the leading causes of death and disability. Understanding the types of policy and area-level changes that can effectively lead to a decline in violence remains a public health priority. Our study replicates the finding that misdemeanor arrests have a small protective impact on homicide, but we find that physical order is not a plausible mechanism through which policing operates. Drug activity and public assistance were associated with changes in homicide, indicate that policing is not the sole factor responsible for the homicide decline in NYC. These findings underscore the need for further inquiry into the full range of factors, including not only law enforcement practices but structural and cultural conditions that increase or decrease levels of criminal violence in urban neighborhoods.

ACKNOWLEDGMENTS

We thank Bernard Harcourt and Jens Ludwig for providing us with the data on police manpower, and to Richard Rosenfeld for providing data on incarceration.

REFERENCES


