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Race/Ethnic-Specific Homicide Rates in New York City: Evaluating the Impact of Broken Windows Policing and Crack Cocaine Markets

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Abstract

The current study evaluated a range of social influences including misdemeanor arrests, drug arrests, cocaine consumption, alcohol consumption, firearm availability, and incarceration that may be associated with changes in gun-related homicides by racial/ethnic group in New York City (NYC) from 1990 to 1999. Using police precincts as the unit of analysis, we used cross-sectional, time series data to examine changes in Black, White, and Hispanic homicides, separately. Bayesian hierarchical models with a spatial error term indicated that an increase in cocaine consumption was associated with an increase in Black homicides. An increase in firearm availability was associated with an increase in Hispanic homicides. Last, there were no significant predictors for White homicides. Support was found for the crack cocaine hypotheses but not for the broken windows hypothesis. Examining racially/ethnically disaggregated data can shed light on group-sensitive mechanisms that may explain changes in homicide over time.

Keywords

homicide; race/ethnicity; crack cocaine markets; crime decline; broken windows policing

Long-standing racial disparities exist in homicide victimization, particularly in metropolitan areas. For instance, in New York City (NYC), Blacks have been far more likely to be victims of homicide than Whites (Blumstein & Wallman, 2006; Cook & Laub, 2002; Galea, Tardiff, Ahern, Leon, & Vlahov, 2002; Karmen, 2000; Parker, 2008). Two main race/ethnic-related trends characterized the dramatic homicide decline of the 1990s. First, there was a greater decrease in Black homicides, particularly males, compared to other racial/ethnic groups (Blumstein & Wallman, 2006; Cook & Laub, 2002; Galea et al., 2002; Parker, 2008). Second, despite this drop, the racial gap between Black and White homicides persisted

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throughout the 1990s although it decreased from a difference of 9.5 in 1990 to a difference of 7.9 by 1998 (Galea et al., 2002). Racial/ethnic-specific factors associated with this homicide decline warrant further investigation given these differential homicide patterns as well as the slight reduction in the Black–White disparity.[1]

The 1990s crime drop is indisputable at a national level and within New York City (Blumstein & Wallman, 2006; Karmen, 2000; Zimring, 2007). However, significant theoretical debate exists as to the cause of this decline, with empirical results being, at times, contradictory (Blumstein & Wallman, 2006; Cerdá et al., 2009, 2010; Karmen, 2000; Kelling & Bratton, 1998; Messner et al., 2007; Rosenfeld, Fornango, & Baumer, 2005; Rosenfeld, Fornango, & Rengifo, 2007; Zimring, 2007). The social influences cited for the crime decline include an increase in misdemeanor policing (Kelling & Bratton, 1998; Kelling & Sousa, 2001; Wilson & Kelling, 1982), a transformation in drug markets (Baumer, Lauritsten, Rosenfeld, & Wright, 1998; Blumstein, 1995a, 1995b; Cerdá et al., 2009, 2010; Messner et al., 2007; Rosenfeld, et al., 2007), a decline in alcohol consumption (Cerdá et al., 2010; Parker & Cartmill, 1998; Parker & Rebhun, 1995), a reduction in gun availability (Blumstein, 1995a, 1995b; Blumstein, Rivara, & Rosenfeld, 2000; Blumstein & Rosenfeld, 1998; Blumstein & Wallman, 2006), and an increase in incarceration (Corman & Mocan, 2005; Rosenfeld, 2006; Spelman, 2006; Zimring, 2007). The present study aims to investigate a full range of theoretically relevant social factors (e.g., shifting cocaine markets, changes in misdemeanor arrests, and gun availability) related to the homicide decline in NYC during the 1990s at a race/ethnic-specific level. As such, the study investigates whether there were uniform associations with changes in homicide across racial/ethnic groups.

Previous Research and Theoretical Premise

Empirically rigorous studies that have simultaneously considered several competing mechanisms and evaluated changing rates of NYC homicides, rather than absolute levels, have consistently found that (a) alcohol consumption has no impact on overall homicide or gun-related homicide but is associated with gun-related homicide among 25- to 34-year-olds, (b) gun availability is not associated with overall homicide or gun-related homicide, and (c) incarceration rates have no impact on overall homicide or gun-related homicide but have an inverse impact on gun-related homicide among 15- to 24-year-olds (Cerdá et al., 2009, 2010; Messner et al., 2007; Rosenfeld et al., 2007). Conversely, misdemeanor arrests and cocaine consumption have been consistently linked to overall homicide rates, gun-related homicide rates, and gun-related homicides among those 35 years and older (Cerdá et al., 2009, 2010; Messner et al., 2007; Rosenfeld et al., 2007). Notably, cocaine consumption was also related to gun-related homicide rates among 15- to 24-year-olds (Cerdá et al., 2010). Thus, misdemeanor arrests and cocaine consumption have a broad association to homicide rates in general, with some variation by demographic group.

The theoretical premise behind these two factors—misdemeanor arrests and cocaine consumption—is well developed (Blumsetin & Wallman, 2006; Karmen, 2000; Zimring, 2007). Misdemeanor arrest rates are used to assess the broken windows hypothesis, which suggests that physical disorder and associated misdemeanor crimes invite more serious crimes (Cerdá et al., 2009, 2010; Corman & Mocan, 2005; Harcourt & Ludwig, 2006; Kelling & Sousa, 2001; Messner et al., 2007; Rosenfeld et al., 2007). As such, curbing

[1]A significant body of research has examined race/ethnic-specific homicide arrests. For instance, LaFree, Baumer, & O'Brien (2010) found that significant racial gaps also exist with regard to homicide arrest rates and found convergence in Black–White arrest rates from the 1960s to 1990s. This convergence halted in the 1990s, partly as a result of the peak in the crack cocaine epidemic. Trends and hypotheses between homicide victimization and homicide arrests are not mutually exclusive and often overlap. However, the current article focuses exclusively on homicide victimization rates.

misdemeanor crimes such as public urination and panhandling enhances physical and social order and leads to a reduction in serious crimes such as homicide by demonstrating a general intolerance for crime (Kelling & Bratton, 1998; Kelling & Sousa, 2001; Wilson & Kelling, 1982).

Cocaine consumption is used as a proxy for gauging illegal drug market activity, particularly crack cocaine (Cerdá et al., 2009, 2010; Messner et al., 2007; Rosenfeld et al., 2007). Blumstein (1995a, 1995b) proposed a systemic mechanism by which the shift in drug markets may have contributed to the 1990s crime decline. The mid- to late 1980s witnessed a rapid increase in the use of crack cocaine (Johnson, Golub, & Dunlap, 2006; Johnson, Golub, & Fagan, 1995). This high demand for crack cocaine and competition for lucrative areas resulted in turf wars. Guns were acquired by drug dealers and then diffused through the community for self-protection, which led to an increase in gun-related crimes. Subsequently, as demand for crack decreased, and drug markets began moving off the streets into more private spaces, crime began to decline (Blumstein, 1995a; Wendel & Curtis, 2000).

Relatively little research exists with regard to the race/ethnic-specific applicability of these hypotheses in relation to the homicide decline. According to the racial invariance hypothesis, the impact of these social influences on homicide should be similar across race/ethnicity, if there is equivalent exposure and distribution (Sampson & Bean, 2006; Sampson & Wilson, 1995). Research examining racial invariance has largely focused on structural factors such as poverty, unemployment, and residential segregation, with little focus on other social influences such as policing and drug markets. Studies with structural factors have had mixed results, with some studies finding invariance between structural factors and homicides (Feldmeyer, 2010; Steffensmeier, Ulmer, Feldmeyer, & Haris, 2010) and others finding a stronger association for the relationship between structural factors and homicide for Whites relative to Blacks (Ousey, 1999). Extending this prior work, the present study examines racial invariance among social factors on homicide with the expectation of some racial/ethnic differences given the varying levels of exposure.

First, theoretically, the goal of misdemeanor policing in enhancing order and control should be beneficial across race/ethnicity (Wilson & Kelling, 1982). However, theory diverges from practice and this type of policing has been more directly targeted toward minority groups and disadvantaged communities (Fagan & Davies, 2000; Gelman, Fagan, & Kiss, 2007; Greene, 1999; Rosenfeld et al., 2007).[2] As such, Blacks and Hispanics, compared to Whites, are more likely to be exposed to misdemeanor policing. Yet, no study has examined the relationship between misdemeanor arrest rates and race/ethnic-specific homicide rates.

Second, Black youth were disproportionately represented in illegal drug markets during the 1990s (Blumstein, 1995a, 1995b; Blumstein & Rosenfeld, 1998; Substance Abuse and Mental Health Services Administration [SAMHSA], 1995). This would suggest that a change in these markets is more specifically linked to Black homicides than Hispanic or White homicides. Two studies directly address the issue of illegal drug markets and race-specific homicide rates and yield contradictory results (Ousey & Lee, 2004; Storm & MacDonald, 2007). Ousey and Lee (2004) found that illegal drug markets, using race-specific arrest rates for the sale of cocaine/opiate as a proxy, significantly influenced both Black and White homicides, but the relationship was stronger for Blacks. On the other hand, Strom and MacDonald (2007) found that illegal drug markets, using race-specific drug arrest rates, were significantly associated with White teenage homicides while socioeconomic

[2]These studies mainly focus on stop and frisk practices that are considered a part of broken windows policing. However, they do not examine misdemeanor arrests.

disadvantage was associated with Black teenage homicides. While drug arrest rates are a useful proxy, they may be more linked to drug enforcement than to drug activity (Baumer et al., 1998; Rosenfeld, & Decker, 1999). The current study seeks to expand on these two studies by focusing on the NYC homicide decline and using two different precinct-level indicators for illegal drug market activity—drug arrest rates and cocaine consumption, as indicated by the proportion of accident deaths positive for cocaine toxicology.

Last, Hispanic homicide rates remain relatively underexplored, even though Hispanics are a distinct group with a social and cultural milieu different from that of Blacks and Whites and have unique predictors (Martinez, 2002; Martinez & Lee, 1999a, 1999b). A few studies have examined homicide rates among Hispanics, Whites, and Blacks, finding a relationship between disadvantage and homicide across racial/ethnic groups with the strength of this relationship varying by group (Martinez, 2002; Steffensmeier et al., 2010). This is consistent with the Latino Paradox, which indicates that Hispanics generally fare better with regard to violence even in the face of extreme disadvantage (Sampson, 2008).

Current Study

The current study seeks to extend research on racial invariance by examining the impact of social influences on homicide rates by examining gun-related homicide rates among Blacks, Whites, and Hispanics in NYC during the 1990s. Specifically, the present study investigates two main hypotheses. First, racial invariance is expected between misdemeanor policing and homicide rates among Blacks and Hispanics given the likelihood of equivalent exposure to such policing across those two groups. As such, an increase in misdemeanor policing is hypothesized to be associated with reduced homicide rates for Blacks and Hispanics but not for Whites. Second, racial invariance is not expected in homicide rates among Hispanics, Blacks, and Whites with regard to crack cocaine markets. The greater presence of Black youth in illegal drug markets during the 1990s suggests that a decrease in cocaine consumption and drug arrests will be associated with a decrease in Black homicides but not Hispanic or White homicides.

Materials and Method[3]

Data were collected from five sources: the Office of the Chief Medical Examiner (OCME) of NYC, the NYC Police Department (NYPD), the NYC Human Resources Administration (HRA), the New York State Division of Criminal Justice Services (NYS-CJS), and the U.S. Census Bureau. The present study utilizes police precincts as the unit of analysis because (a) it is the unit of interest that is most appropriate for studying social influences of policing and (b) census tracts and other small areal units of analysis do not provide adequate denominators (i.e., at least 5,000 persons) of the specific race/ethnicity to estimate stable rates of change (Haynie & Armstrong, 2006; Ousey, 1999; Peterson & Krivo, 1999).

NYC has 76 police precincts. For purposes of the current analysis, Precincts 33 and 34 were treated as one precinct because they were split in 1994. The Central Park Precinct (Precinct 22) was excluded because it is nonresidential. As with other city-level studies, only police precincts with a minimum of 5,000 persons for the race/ethnicity of interest were included to calculate stable rates of victimization (Haynie & Armstrong, 2006; Ousey, 1999; Peterson & Krivo, 1999). Based on this inclusion criterion, the final sample consisted of 57 precincts for Whites, 54 precincts for Blacks, and 69 precincts for Hispanics.[4] Differences between included and excluded precincts are discussed in detail in the results section.

[3]The New York Academy of Medicine Institutional Review Board approved the original data acquisition and analysis. John Jay College of Criminal Justice approved secondary data analyses of deidentified data.

Homicide

All homicide cases from 1990 to 1999 were identified through manual review from OCME medical files. Information was abstracted by trained researchers using standard protocols and data collection forms. OCME files contained data regarding cause of death, circumstances of death (including use of a gun), and toxicology. The OCME investigators determine cause of death using the decedent's medical history, the circumstances and environment of the death, autopsy findings, and laboratory data. Furthermore, the OCME investigates all deaths of people believed to have died from unnatural causes. As such, all homicide deaths were available for data extraction, thereby limiting any sampling bias. The same person has held the office of NYC Chief Medical Examiner since 1990 and has performed toxicology and drug reports over the 10-year period.

All OCME cases from 1990 to 1999 with valid address data were geocoded and matched to a police precinct by address of injury using ArcGIS software, version 9.0 (ESRI, Redlands, CA). The current analyses are limited to gun-related homicides because the two types of homicides—gun vs. nongun—demonstrate distinctive trends over the decade (Fagan, Zimring, & Kim, 1998; Messner et al., 2007) and both broken windows and crack cocaine hypotheses are empirically linked to gun-related, rather than non-gun-related, homicides (Blumstein, 1995a; Blumstein & Rosenfeld, 1998; Messner et al., 2007).

Race/ethnic-specific gun-related homicide rates (White, Black, and Hispanic) were calculated for each year, per 100,000 population for the specific race/ethnicity. Notably, the OCME office in NYC uses the category "Hispanic" to designate this ethnic group regardless of race. For linguistic convenience, the terms "White" and "Black" thus refer to "Non Hispanic White" and "Non Hispanic Black." Classification was based on what the identifying family or friend considered to be the race/ethnicity of the decedent. The total annual precinct population was estimated through linear interpolation for the years between census population estimates of 1990 and 2000. The 1990 and 2000 race/ethnic categories differed, in that the 2000 census allowed for multiple races. When multiple races were endorsed, the respective percentage was added to the denominator to allow for accurate linear interpolation. For example, if a person reported both Black and White race in 2000, 0.5 would have been added to each of the Black and White population counts.

Misdemeanor Policing

NYPD provided data on all misdemeanor arrests by precinct. The misdemeanor arrest rate was calculated per 10,000 population from 1990 to 1999 for each precinct.

Drug Arrests

NYS-CJS data were used to calculate drug arrests per 10,000 population from 1990 to 1999 based on the number of arrests for controlled substance per precinct (Ousey & Lee, 2004; Storm & MacDonald, 2007). In an attempt to capture more severe drug activity such as crack cocaine markets, this variable did not include marijuana arrests.

Cocaine Consumption

OCME data were used to calculate the annual proportion of accidental deaths with toxicology results positive for cocaine from 1990 to 1999, as a proxy for precinct cocaine consumption (Cerdá et al., 2010; Messner et al., 2007).

[4]The 1990s census data excluded 12 precincts for Whites, 21 precincts for Blacks, and 7 precincts for Hispanics, while the 2000 census data excluded 17 precincts for White homicides, 20 precincts for Blacks, and 5 precincts for Hispanics. The 2000 census data was used for a more conservative estimate.

Alcohol Consumption

OCME data were used to calculate the annual proportion of accidental deaths with toxicology results positive for alcohol from 1990 to 1999, as a proxy for precinct alcohol consumption (Cerdá et al., 2010).

Firearm Availability

OCME data were used to calculate the annual proportion of gun-related suicide deaths from 1990 to 1999, as a proxy for precinct firearm availability (Cerdá et al., 2010; Messner et al., 2007). This measure has demonstrated a high correlation with survey-based measures of firearm availability (Azrael, Cook, & Miller, 2004).

Incarceration Rates

NYS-CJS data were used to calculate incarceration rates per 10,000 from 1990 to 1999, based on the number of prison admissions per precinct (Cerdá et al., 2010).

Potential Confounders

Informed by prior research, the analyses included a range of control variables (Cerdá et al., 2010; Land & McCall, & Cohen, 1990; McCall, Parker, & MacDonald, 2008; Messner et al., 2007; Nielsen, Lee, & Martinez, 2005). The rate of misdemeanor complaints per 10,000 population was used to adjust for a potential endogenous response of misdemeanor arrests to underlying levels of crime. The ratio of felony arrests to the number of felony complaints from 1990 to 1999 was included to assess whether increased police activity for both serious and minor offenses, rather than only minor offenses captured by misdemeanor arrests, was responsible for the decline in homicides. The number of police officers assigned to each police precinct from 1990 to 1999 was included to capture increases in the size of law enforcement personnel within the precinct. These three covariates were available for each year from 1990 to 1999 and obtained from the NYPD. The percentage of the precinct population on public assistance from 1990 to 1999 was obtained from the NYC HRA (Robert, 1999; Sampson, 1997) and was used as a measure of neighborhood disadvantage. Finally, the sociodemographic composition of the precinct was captured in several covariates derived from 1990 U.S. Census Data (Summary File 3); these data were obtained from Infoshare Online (www.infoshare.org) at the census tract level and then aggregated to the police precinct level.[5] Sociodemographic covariates included percent male, percent under age 35, percent Black, percent Hispanic, percent foreign-born, and percent unemployed as well as a composite measure of concentrated poverty, which summed the percentage of persons living below 200% of the poverty line (to account for the high costs of living in NYC), the percentage of persons with less than a high school education, and the percentage of female-headed households. Each variable was weighted by its factor loading from a principal components analysis. Higher scores indicated greater levels of concentrated poverty. All sociodemographic covariates were standardized to a mean of 0 and a standard deviation of 1 to improve convergence, enhance comparability, and ease interpretation.

Statistical Analyses

All analyses were based on “change” Bayesian hierarchical models, traditionally used in disease mapping (Clayton & Kaldor, 1987; Waller & Gotway, 2004). Using Winbugs, models were defined as

[5]Infoshare uses data at the smallest geographic area at which it is publicly available, usually census tracts and zip codes. It then develops a series of overlap factors, which aggregates this small-scale data to the precinct and other higher levels. The overlap factors are based on the distribution of residential housing. The overlaps approximate as closely as possible the distribution of the population by residence. In general, precinct level data are generally expected to be accurate within 1% to 3%.

$$\Delta Y_{it} = \alpha_t + b_1 \Delta X_{arrests_{it}} + b_2 \Delta X_{drug_{it}} + b_3 \Delta X_{coke_{it}} + b_4 \Delta X_{alcohol_{it}} + b_5 \Delta X_{firearms_{it}} + b_6 \Delta X_{incarceration_{it}} + \Pi \Delta L_{it} + B V_i + \lambda_i$$
$$\lambda \sim \text{CAR Normal}\,(W, \tau_\lambda)$$
$$\tau_\lambda \sim \text{Gamma}\,(0.5, 0.0005)$$

where ΔY_{it} was the change in the race/ethnic-specific homicide rate between times *t* and *t + 1* in precinct *i* for time period *t*, $\Delta X_{arrests_{it}}$ was the change in the misdemeanor arrest rate per 10,000 between times *t* and *t + 1* in precinct *i*, $\Delta X_{drug_{it}}$ was the change in drug arrest rate per 10,000, $\Delta X_{coke_{it}}$ was the change in the proportion of accident deaths positive for cocaine toxicology, $\Delta X_{alcohol_{it}}$ was the change in the proportion of accident deaths positive for alcohol toxicology, $\Delta X_{firearms_{it}}$ was the change in the proportion of gun-related suicides, $\Delta X_{incarceration_{it}}$ was the change in the incarceration rate per 10,000, ΔL_{it} was the change in a vector of time-varying covariates (i.e., misdemeanor complaints, felony arrests, police manpower, public assistance), V_i was a set of baseline covariates (i.e., sociodemographic covariates from 1990 U.S. Census data), and λ_i was a random spatially structured effect (Xia & Carlin, 1998). Spatial error was included in the models to account for the spatial dependence of risk for homicide in nearby precincts. The spatial random effect was modeled with a prior that has a conditionally autoregressive (CAR) distribution, with weights for first-order adjacent neighbors set at 1 (“neighbors” defined as precincts sharing a border; Richardson, Abellan, & Best, 2006). This method attempts to overcome the limitation of Ordinary Least Squares (OLS) regressions, which assumes spatial independence by controlling for dependence among the residuals (Lichstein, Simons, Shriner, & Frenzreb, 2002).

Models were estimated with Winbugs using two parallel Markov chain Monte Carlo (MCMC) chains (Spiegelhalter, Thomas, Best, & Lunn, 2003). Convergence of chains was visually inspected. Models were run for 100,000 iterations, with the first 50,000 iterations discarded as burn-in. Statistics were obtained only on the last 50,000 iterations, resulting in a sample of 100,000.

Three sets of models were run for each race/ethnic group (Blacks, Whites, and Hispanics). Model 1 included the theoretical variables of interest (i.e., misdemeanor arrests, drug arrests, cocaine consumption, alcohol consumption, firearm availability, and incarceration rates) as well as the misdemeanor complaint rate, to account for the potentially endogenous police response to criminal complaints. Model 2 included the remaining time-varying covariates (i.e., felony arrests, size of police manpower, and percent receiving public assistance) and Model 3 introduced all time-invariant covariates. The Deviance Information Criterion (DIC), a criterion similar to Akaike’s Information Criterion (AIC), was used to assess model fit. Similar to AIC, smaller numbers indicate better fit, and a change within 1 to 2 points is considered negligible, whereas a change between 3 to 7 points suggests a potentially better fit (Spiegelhalter, Best, Carlin, & van der Linde, 2002). Results are presented for the best fitting model based on the DIC.

Results

Of the 14,230 homicides that occurred in NYC from 1990 to 1999, 10 occurred in Central Park and were removed because no one lives in that area, 2,072 (14.6%) were missing precinct of injury information, of which 1,368 (66.2%) were gun-related homicides. This resulted in 12,148 homicides classified by a valid precinct of injury. Of these, 8,816 (72.6%) were gun-related homicides. Analyses were limited to Black (*n* = 4,595; 54%), Hispanic (*n* = 3,224; 38%), and White (*n* = 670; 8%) homicides, for a total of 8,489 homicides.

Figure 1 illustrates race/ethnic-specific homicide rates per 100,000 for the entire city (i.e., all 74 precincts). The decline in homicide rates was particularly pronounced for Blacks and Hispanics, whereas the decline for Whites was less striking. Consistent with previous work, Blacks continued to exhibit higher homicide rates compared to Whites and Hispanics throughout the 1990s.

To assess potential effects of the inclusion criteria (i.e., population size of at least 5,000 per race/ethnicity), we examined differences in the mean rates of change of all covariates of interest for precincts that were included versus excluded from the analyses (see appendix for means and standard deviations). The results report the Satterthwaite statistics for instances where the homogeneity of variance assumption is violated. Misdemeanor arrests significantly differed for precincts included for Black, $t(1, 72) = -2.66$, $p = .009$, and Hispanic, $t(1, 72) = -2.00$, $p = .049$, homicide rates indicating an increase in misdemeanor arrests, whereas excluded precincts demonstrated a decrease in misdemeanor arrests. Conversely, precincts were not significantly different for White homicide rates, $t(1, 18.7) = 1.01$, $p = .323$. Stated differently, precincts included for Black and Hispanic homicide rates had a greater increase in rates of misdemeanor arrests relative to those excluded, whereas precincts included for White homicide rates were similar in changes in misdemeanor arrests relative to those excluded. All other variables of interest, including drug arrest rates, cocaine consumption, alcohol consumption, and incarceration rates did not differ for precincts included versus excluded from analyses.[6]

Table 1 presents the descriptive statistics for each variable of interest for 1990 to 1999 among the precincts included in the analysis for gun-related homicide rates for each race/ethnicity. Drug arrest rates, proportion of accidental deaths positive for cocaine toxicology, proportion of accidental deaths positive for alcohol toxiocology, proportion of suicide deaths caused by firearms and incarceration rates were highest among precincts with at least 5,000 Black residents, followed by precincts with at least 5,000 Hispanic residents. Misdemeanor arrest rates were highest in precincts with sizable Hispanic populations, followed by precincts with sizable White populations. Temporal sequencing indicates that misdemeanor arrest rates per 10,000 population increased substantially from 1990 to 1999 in precincts with at least 5,000 Black residents (1990 $M = 340.24$, $SD = 340.24$; 1999 $M = 451.96$, $SD = 298.67$) or at least 5,000 Hispanic residents (1990 $M = 348.63$, $SD = 395.80$; 1999 $M = 429.92$, $SD = 342.78$). The increase in misdemeanor arrest rates was substantially less for precincts with at least 5,000 White residents (1990 $M = 340.47$, $SD = 473.76$; 1999 $M = 381.25$, $SD = 354.48$).

Table 2 presents the DIC estimates for all three models for each race/ethnic group. Model 1 was the best fitting model across race/ethnicity.

Table 3 displays the results for the best fitting models for White, Black, and Hispanic homicides. Results for all three models by race/ethnicity are available, on request. Coefficients were standardized to illustrate the magnitude of the effects. For White homicides, there were no significant predictors. A different pattern emerged for Black

[6]Drug arrest rates were not significantly different for precincts with sizable White, $t(1, 16.3) = -0.57$, $p = .577$, Black, $t(1, 20.1) = -1.72$, $p = .100$, and Hispanic, $t(1, 4.01) = -1.25$, $p = .278$, populations. The other drug indicator—proportion of accidental deaths positive for cocaine toxicology—yielded similar results and there were no significant difference in precincts included versus excluded for analyses of White, $t(1, 18.4) = 0.25$, $p = .804$, Black, $t(1, 64.1) = -0.05$, $p = .959$, and Hispanic, $t(1, 72) = -0.45$, $p = .655$, homicide rates. Similarly, there were no significant differences in precincts included versus excluded on proportion of accidental deaths positive for alcohol toxicology for analyses of White, $t(1, 19.8) = -0.09$, $p = .933$, Black, $t(1, 52.1) = -1.86$, $p = .068$, and Hispanic, $t(1, 72) = -1.76$, $p = .083$, homicide rates. Last, there were no significant differences in precincts included versus excluded on proportion of suicide deaths caused by firearms for analyses of White, $F(1, 72) = -1.00$, $p = .319$, Black, $F(1, 72) = 0.08$, $p = .932$, and Hispanic, $F(1, 72) = 0.63$, $p = .534$, homicide rates and or incarceration rates for analyses of White, $t(1, 18.3) = -0.01$, $p = .996$, Black, $t(1, 21.5) = -1.56$, $p = .133$, and Hispanic, $t(1, 4.03) = -2.09$, $p = .104$.

homicide rates. Results indicated that a one–standard deviation increase in the proportion of accidental deaths positive for cocaine consumption in the precinct (or 10.80%) was associated with 2.16 more homicides per 100,000 people (PM: 0.21, 95% CI: [0.06, 0.36]). Stated conversely, decreased cocaine consumption was associated with a reduction in homicide victimization among Blacks. With regard to gun-related homicides among Hispanics, a standard deviation increase in the proportion of suicide deaths caused by firearms (21.88%) was associated with 1.09 more Hispanic homicides (PM: 0.05, 95% CI: [0.001, 0.10]). Again, a decrease in firearm availability resulted in a decrease in gun-related homicide among Hispanics.

Discussion

The current study used a broad range of theoretically relevant social factors to examine race/ethnic-specific homicide decline in NYC during the 1990s. Consistent with previous research that used other sources of data, we found a dramatic decline in Black homicides during the 1990s (Blumstein & Rosenfeld, 1998; Blumstein & Wallman, 2006; Parker, 2008). Hispanic homicides paralleled the drop in Black homicides; White homicides exhibited the least change. The current study also found that the factors associated with changes in homicides varied by race/ethnic group and generally lend further support to the crack cocaine hypothesis but not the broken windows hypothesis. Black homicide decline was associated with a decrease in cocaine consumption while Hispanic homicide decline was associated with a decrease in firearm availability.

Several factors are noteworthy with regard to the racial/ethnic invariance hypothesis. First, the change in the rate of exposure to misdemeanor policing does not appear to be equivalent across race/ethnicity. Precincts with a minimum of 5,000 Blacks and Hispanics had a greater increase in the misdemeanor arrest rates, while precincts with a minimum of 5,000 Whites did not experience a significant increase. These results lend further support to the conclusion that misdemeanor policing during the 1990s was focused on communities with higher minority populations (Rosenfeld et al., 2007).

Second, exposure to drug arrests, cocaine consumption, alcohol consumption, firearm availability, and incarceration rates does not appear to be equivalent across race/ethnicity. Indeed, precincts with a minimum of 5,000 Blacks had higher rates of exposure to all of these variables, with the exception of misdemeanor arrests, relative to precincts with a minimum of 5,000 Whites. Hispanics generally tended to fall somewhere in between the two groups. Similar to structural factors, social mechanisms and problematic occurrences tended to be the most prevalent among precincts with more Blacks (Sampson & Bean, 2006).

Third, misdemeanor policing was not associated with homicide victimization across race/ethnic groups for the sampled precincts. Previous research has been mixed; some studies have found support for the association between misdemeanor policing and homicide (Cerdá et al. 2010; Kelling & Bratton, 1998; Kelling & Sousa, 2001; Messner et al., 2007; Rosenfeld et al, 2007; White, Fyfe, Campbell, & Goldkamp, 2003; Wilson & Kelling, 1982), while others have not (Eck & Maguire, 2000; Harcourt, 2001; Harcourt & Ludwig, 2006; Joanes, 2000; Levitt, 2004). Differences in the approach used to measure misdemeanor policing and variation in the demographic composition of the studied samples may explain these contradictory findings. With respect to sample composition, research by Cerdá et al. (2010) found that the effect of misdemeanor policing on homicide victimization rates in New York City over the same time period varied by age. They reported a significant effect for older adults (above 35) but not for younger age groups. The disaggregation by race/ethnicity has reduced the number of precincts available for estimating the race/ethnic-specific models, thereby altering the age composition of victims “captured” in the data.

Moreover, the age-related selection bias varies by race, with the most "high risk" racial/ethnic group—Blacks—exhibiting a bias in the direction of younger victims (the age composition in the sample for Hispanics is similar to that for the city at large, whereas for Whites, the sampled precincts include a greater percentage of victims in the older bracket).[7] The selection bias associated with age composition might thus conceivably result in an underestimate of the impact of policing on changing homicide levels in the race-specific analyses.[8] In principle, it would be instructive to examine the impact of policing on victimization rates disaggregated by *both* age and race, but this would require a different type of research design given the dwindling number of cases in precincts.

The positive association between cocaine consumption and Black homicides is consistent with the notion that Black Americans were disproportionally affected by illegal drug markets in the 1990s (Blumstein, 1995a, 1995b; Blumstein & Rosenfeld, 1998; SAMHSA, 1995). The results are partially consistent with Ousey and Lee (2004) but inconsistent with the Storm and MacDonald findings (2007)—both studies that use drug arrests as a proxy for crack cocaine markets. These differences may reflect variations in sample age; in analyses conducted at the intercity, rather than intracity level; and inclusion of additional covariates within the current analyses.

Interestingly, in our study, drug arrest rates were not associated with homicide rates across race/ethnicity. This indicates that the measures of cocaine consumption and drug arrest rates capture different constructs. The theoretically congruent results of cocaine consumption suggests that this might be a powerful indicator of drug activity relative to drug arrests, which may be less relevant to drug activity but more related to law enforcement of drug activity. Replication and further research in this area are warranted to delineate the association between race/ethnic-specific homicides and crack-cocaine drug markets.

The association between firearm availability and homicide rates among Hispanics is inconsistent with previous research that accounts for a host of crime relevant variables on change in homicide rates among the general population and at age-specific levels (Cerdá et al., 2010; Messner et al., 2007). However, the importance of guns in the rise of homicides has been cited consistently. Indeed, the increase in homicide was specific to gun-related rather than non-gun-related homicides (Fagan et al., 1998; Tardiff et al, 1994; Tardiff & Gross, 1986). Theoretically, these results lend further indirect support for the crack cocaine hypothesis, which indicates that the there was an intricate connection between drug markets and gun diffusion in communities. It is unclear, however, why this pattern only appeared with Hispanic homicides and not for Black homicides.

Changes in the social context of the city at large did not impact White homicides. The lack of significant associations may be due to the relatively little "change" in homicide rates that occurred over the decade among this group. The already low homicide rates may make it difficult for social changes to influence homicide rates at a programmatic level and to detect changes at a quantitative level. Regardless, these null results warrant further theoretical and empirical inquiry.

[7]During the period under investigation, 25% of all homicide victims in NYC were above age 35. The respective figures for precincts with data on Black homicide rates, Hispanic homicide rates, and White homicide rates are 20%, 29%, and 51%, respectively.

[8]In addition, as reported above, excluded and included precincts differed significantly in misdemeanor arrests for Blacks and Hispanics. The included precincts exhibited increasing arrests, consistent with the citywide pattern, whereas the excluded precincts actually exhibited decreasing arrests. If the increases in the actual race-specific homicide rates in these excluded precincts (which cannot be estimated due to small sample size) were to be appreciably greater than the rates in the included precincts, the impact of "broken windows" policing would also be underestimated in our models due to sampling bias associated with the policing variable.

The current study has several limitations. The measure of accident deaths positive for cocaine toxicology does not distinguish between crack and other forms of cocaine. Furthermore, while consumption may be a better indicator of use within a neighborhood, it may still not necessarily be accurate as an indicator of illegal drug-market activity within the precinct. The proxy for broken windows policing—misdemeanor arrests—may not capture other forms of order maintenance policing such as ordinance violations being conducted during the 1990s. Third, the nonexperimental design of the study raises issues of endogeneity, which is a common limitation of this type of research.

With these qualifications in mind, our analyses shed light on the divergent results in the broader literature with regard to broken windows policing and crack cocaine markets, which have been based on aggregated data. The significant distinctive relationships by race/ethnicity support the notion that disaggregating the data can provide more insight into factors that are associated with changes in homicide among subgroups. Indeed, to fully understand processes that operate within a community, a closer examination of the neighborhood-level associations involving specific demographic groups is required.

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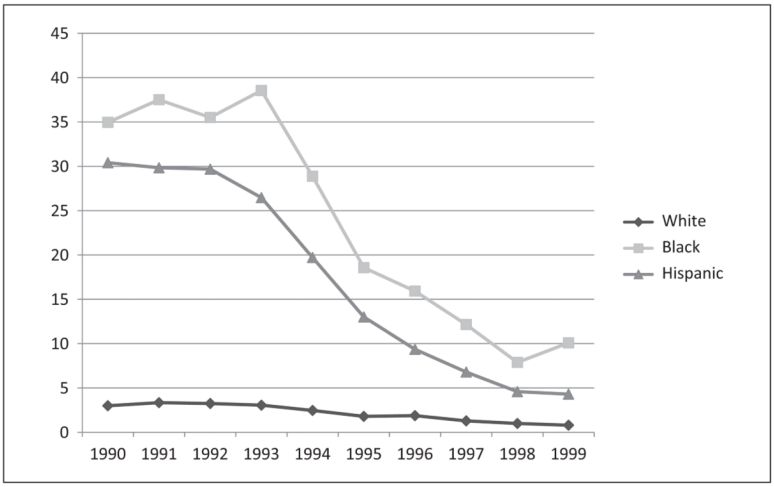

Figure 1.
Race/ethnic-specific gun-related homicide rates per 100,000 in New York City, 1990–1999

Table 1

Descriptive Statistics for New York City Police Precincts by Race/Ethnicity, 1990–1999

	White		Black		Hispanic	
	N = 57		*N* = 54		*N* = 69	
	Mean	***SD***	**Mean**	***SD***	**Mean**	***SD***
Gun-related homicide rate (per 100,000 population)	3.07	6.40	24.56	22.08	15.88	19.54
Exposures of interest						
Rate of misdemeanor arrests per 10,000	391.26	485.04	406.29	302.85	412.93	408.42
Drug arrest rate per 10,000	71.22	99.20	113.03	120.81	102.31	121.95
Proportion of accident deaths positive for cocaine toxicology	6.52	8.66	8.59	10.80	8.00	10.33
Proportion of accident deaths positive for alcohol toxicology	16.73	12.17	17.54	13.49	17.23	13.17
Proportion of suicide deaths caused by firearms	20.56	20.50	22.34	22.40	20.90	21.88
Incarceration rate (per 10,000 population)	20.50	35.00	25.74	22.29	23.74	22.56
Control variables—Time varying						
Rate of misdemeanor complaints per 10,000	746.12	685.92	712.24	310.15	725.77	455.17
Percent receiving public assistance	9.76	7.58	15.53	10.00	13.13	10.13
Ratio of felony arrests per number of felony complaints	0.31	0.18	0.42	0.23	0.38	0.23
Size of police force	216.69	64.14	228.03	59.16	221.43	60.29
Control variables—time invariant—available at 1990						
Concentrated poverty[a]	73.10	31.55	97.00	36.95	87.79	39.44
Percentage of population male	47.24	1.97	46.49	2.10	46.89	2.18
Percentage of population under 35 years of age	50.43	6.85	54.55	6.90	52.49	7.62
Percentage of population Black	18.72	19.81	36.05	27.43	27.47	26.97
Percentage of population Hispanic	21.40	16.09	26.97	18.98	24.51	18.20
Percentage of population foreign-born	26.99	11.30	25.67	12.35	26.46	12.47
Percentage of population unemployed	4.14	0.97	4.82	1.17	4.54	1.19

[a]Concentrated poverty includes the following socioeconomic characteristics aggregated to the police precinct level: percent less than high school education, percent less than 200% of the poverty line, and percent female-headed households; higher scores indicate higher levels of concentrated poverty

Table 2

Deviance Information Criterion by Model for Each Racial/Ethnic Group to Determine the Best Fitting Bayesian Hierarchical Model for Predicting Gun-related Homicides in New York City Police Precincts From 1990 to 1999

	White	Black	Hispanic
Model 1[a]	**3,326.26**	**4,345.15**	**5,359.63**
Model 2[b]	3,326.32	4,346.01	5,363.31
Model 3[c]	3,341.12	4,360.88	5,375.87

Note. Bold numbers indicate best fitting model.

[a]Model 1 included changes in misdemeanor arrests rates, misdemeanor complaint rates, cocaine consumption, drug arrest rates, firearm availability, incarceration rates, and alcohol consumption.

[b]Model 2 added changes in percentage on welfare, felony arrests per complaints, and police force.

[c]Model 3 added percent male, percent under age 35 years, percent Black, percent Hispanic, percent foreign born, percent unemployed, concentrated poverty, and residential stability.

Table 3

Best Fitting Bayesian Hierarchical Models, Including Space Random Effect, Predicting Annual Change in White, Black, and Hispanic Gun-Related Homicide Rates in New York City Police Precincts, 1990–1999[a]

	White (*n* = 57)		Black (*n* = 54)		Hispanic (*n* = 69)	
	median	**95% CI**	**median**	**95% CI**	**median**	**95% CI**
Exposures of interest						
Change in misdemeanor arrest rate[b]	0.004	[−0.005, 0.01]	−0.004	[−0.04, 0.03]	−0.02	[−0.04, 0.004]
Change in drug arrest rate[c]	0.01	[−0.003, 0.03]	−0.04	[−0.09, 0.01]	−0.03	[−0.07, 0.01]
Change in cocaine consumption[d]	−0.03	[−0.08, 0.02]	**0.21**	**[0.06, 0.36]**	0.08	[−0.03, 0.20]
Change in firearm availability[e]	0.01	[−0.01, 0.03]	0.05	[−0.02, 0.11]	**0.05**	**[0.001, 0.10]**
Change in alcohol consumption[f]	0.01	[−0.03, 0.04]	0.06	[−0.05, 0.17]	0.08	[−0.003, 0.16]
Change in incarceration rate[g]	−0.04	[−0.12, 0.04]	0.34	[−0.009, 0.69]	0.15	[−0.12, 0.42]
Control variable						
Change in misdemeanor complaint rates	−0.002	[−0.01, 0.006]	−0.01	[−0.03, 0.02]	0.02	[−0.01, 0.54]
Random effects						
Total standard deviation	**37.26**	**[33.02, 42.23]**	**20.87**	**[19.61, 22.27]**	**17.91**	**[16.95, 18.97]**
Space CAR effect (standard deviation)	**0.04**	**[0.01, 0.29]**	**0.04**	**[0.01, 0.49]**	**0.04**	**[0.01, 0.54]**
Intercept	0.13	[−0.47, 0.73]	**−2.50**	**[−4.53, −0.44]**	**−1.80**	**[−3.40, −0.23]**

Note: All significant associations are highlighted in bold. CAR = conditionally autoregressive.

[a] Model based on estimates from 50,000 to 100,000 iterations (50,000 sample).

[b] Misdemeanor rates were expressed per 10,000 before calculating annual change.

[c] Drug arrest rates were expressed per 10,000 before calculating annual change.

[d] Annual change in proportion of accident deaths with positive cocaine toxicology.

[e] Annual change in proportion of suicides where guns were used.

[f] Annual change in proportion of accident deaths with positive alcohol toxicology.

[g] Incarceration rates were expressed per 10,000 population before calculating annual change.

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Appendix

Means and Standard Deviations for Change Scores in Precincts Included Versus Excluded From Analyses

	White		Black		Hispanic	
	Included (*n* = 57)	**Excluded (*n* = 17)**	**Included (*n* = 54)**	**Excluded (*n* = 20)**	**Included (*n* = 69)**	**Excluded (*n* = 5)**
Rate of misdemeanor arrests per 10,000	4.53 (23.03)	15.83 (44.15)	12.41** (28.82)	−7.14 (26.13)	8.92* (28.09)	−17.62 (37.54)
Drug arrests rate per 10,000	−0.23 (7.67)	−5.88 (40.77)	2.13 (9.51)	−11.41 (34.66)	0.93 (10.38)	−35.45 (64.83)
Proportion of accidental death positive for cocaine toxicology	−0.39 (1.00)	−0.27 (2.00)	−0.36 (1.44)	−0.38 (0.74)	−0.35 (1.27)	−0.62 (1.62)
Proportion of accident deaths positive for alcohol toxicology	−0.37 (2.07)	−0.44 (3.33)	−0.13 (2.57)	−1.08 (1.68)	−0.26 (2.41)	−2.17 (1.16)
Proportion of suicide deaths caused by firearms	−0.62 (2.86)	−1.47 (3.78)	−0.83 (3.25)	−0.76 (2.68)	−0.87 (3.07)	0.03 (3.53)
Incarceration rate (per 10,000 population)	−0.93 (2.62)	−0.93 (5.42)	−0.41 (2.22)	−2.32 (5.32)	−0.38 (1.93)	−8.46 (8.60)

* $p < .05$.

** $p < .01$.

*** $p < .001$.