Homicide Studies
Volume 10 Number 2
May 2006 79-97

10.1177/1088767905285449
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Police Murders

An Examination of Historical Trends in the Killing of Law Enforcement Officers in the United States, 1947 to 1998

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This study uses multivariate econometric and time series analysis techniques to examine historical trends in the felonious killing of law enforcement officers in the United States from 1947 to 1998. Of particular interest is the extent to which the correlates of police murder rates are characterized by historical specificity. We also focus on the ability of economic deprivation, deterrence, and social disorganization theories to explain trends in police murder rates across time. The findings of this study indicate (a) that police murder rates in the United States are characterized by distinct historical periods (1947 to 1971, 1972 to 1998) in which the structural correlates of police murder vary and (b) that both economic deprivation and deterrence theories are relevant for understanding trends in police murder although the effects of the latter are historically specific.

Keywords: *police murders; law enforcement; time series; historical trends*

On any given day, law enforcement officers are asked to perform a wide range of tasks that can expose them to dangerous persons and situations. Although the vast majority of police encounters with the public are peaceful, some incidents result in officers being injured or even killed. For example, the FBI (2004) reports that 56 law enforcement officers were feloniously killed in the line of duty in 2002. The risk of violent death is not limited to inexperienced or careless officers; of the officers killed in 2002, 42% had more than 10 years of experience, and about 66% were wearing body armor (FBI, 2004). The threat of being killed on the job is also not limited to large metropolitan area officers. In 2002, less than half of officers killed in the line of duty worked in cities with populations greater than 10,000 people (FBI, 2004).

Research on historical trends in police murders indicates that the rate of police murder has steadily declined since the early 1970s from nearly 38 per 100,000 officers in

Authors' Note: An earlier version of this article was presented at the 2004 annual meeting of the Academy of Criminal Justice Sciences in Las Vegas, Nevada. We thank anonymous reviewers for their helpful feedback on earlier versions of this article.

1971 to about 10 per 100,000 in 1992 (Quinet, Bordua, & Lassiter, 1997). Although several studies have attempted to study trends in police murder and its correlates, they tend to be descriptive (Edwards, 1995; Quinet et al., 1997; Wilbanks, 1994) or to employ cross-sectional analytical approaches (Bailey, 1982; Bailey & Peterson, 1987; Boylen & Little, 1990; Chamlin, 1989; Jacobs & Carmichael, 2002; Peterson & Bailey, 1988). With few exceptions (Bailey & Peterson, 1994; Southwick, 1998), the use of econometric or time series techniques in police murder research is rare. One explanation for this is that until recently, a major impediment to time series research existed in the absence of a sufficient span of historical data on police murders. However, Kaminski and Marvell (2002) recently made available data on police murders for 1930 to 1998 obtained from the National Law Enforcement Officers Memorial Fund (NLEOMF). As they note, these data provide new opportunities for research on historical trends in police murders.

The current study attempts to expand our understanding of police murders in the United States by employing econometric and time series regression techniques to study NLEOMF data for 1947 to 1998. We examine the impact of a variety of theoretically and historically relevant factors on trends in police murders, drawing specifically on social disorganization and social control theories, economic deprivation and strain theories, and deterrence theory. Although Kaminski and Marvell (2002) analyze data for 1930 to 1998, their analyses are limited in terms of the factors considered as explanatory variables. This is likely, at least in part, a function of the absence of reliable historical indicators dating back to 1930. By initiating the study period in 1947, we are able to examine the impact of a variety of potentially important theoretical and historical variables on trends in police murder across time that have not been previously studied.

Theoretical and Conceptual Framework

A significant portion of previous research on police officer murders has consisted of descriptive analyses of cross-sectional data (Boylen & Little, 1990; Chapman, 1976, 1986; Edwards, 1995; FBI, 1992; Konstantin, 1984; Little, 1984; Quinet et al., 1997; Wilbanks, 1994). For the most part, these studies provide summary information on the characteristics of the officers killed, the suspects, and the circumstances surrounding the incident. Other studies have attempted to compare the murder of police officers with those of other societal members to determine if they occur at the same rate and are a function of the same explanatory variables (Kaminski & Marvell, 2002; Peterson & Bailey, 1988). Frequently, such an approach does not involve any systematic application of criminological theory (Kaminski, 2004). In this study, we draw on three prominent criminological perspectives and consider their implications for studying historical trends in police murder and its correlates. In the following, we discuss these theoretical perspectives and the existing previous research.[1]

Economic Deprivation and Strain

Poor economic conditions are likely to be associated with increased levels of crime and violence. Through their impact on wages and labor force participation opportunities, economic downturns produce stress and frustration as they constrain the ability to support oneself and family and to meet financial obligations to creditors (Henry & Short, 1954). Furthermore, poor economic conditions affect opportunities for financial success and the acquisition of material goods, both of which are linked to social status in capitalist societies. Although the impact of poor economic conditions may be felt most acutely by the most deprived segments of society, virtually all societal members experience negative effects to some degree. Economic downturns also affect the larger society by affecting, for example, levels of taxation and the use of social services (Batton & Jensen, 2002). Finally, they affect the temporal and spatial distribution of routine and leisure activities. Poor economic conditions are likely to result in higher levels of violence against the police as they contribute to higher levels of crime and violence in general.

Previous research on the impact of economic conditions on police murder rates has produced mixed results. Consistent with the strain–economic deprivation perspective, research findings indicate a positive economic deprivation–police murder relationship. For example, a series of cross-sectional analyses of state-level data from the 1960s to 1980s found partial support for a link between police murders, poverty, and unemployment (Bailey, 1982; Bailey & Peterson, 1987; Chamlin, 1989; Peterson & Bailey, 1988). In contrast, city-level data analyses covering much of the same time frame have found null or negative relationships between economic deprivation and police murders (Fridell & Pate, 1995; Jacobs & Carmichael, 2002; Lester, 1978a, 1978b). Less research has been conducted on the impact of inequality, but studies generally report nonsignificant effects once other economic indicators are controlled (Chamlin, 1989; Peterson & Bailey, 1988). Finally, in a recent time series analysis of 1930 to 1998 U.S. police murder data, Kaminski and Marvell (2002) found effects that were negative for income, positive for inflation, and null for unemployment. In sum, research on the impact of economic deprivation on police murders is inconclusive.

Social Disorganization and Social Control

From the perspective of social disorganization and control theories, crime and violence are more likely when the social bonds linking individuals to one another, as well as to social institutions and the larger society, are weak or nonexistent (Hirschi, 1969). It is through interaction with others, especially those with whom individuals have strong relationships, that informal control mechanisms function to regulate behavior. In the absence of social bonds and emotional attachments to conventional others and institutions, there is a breakdown in informal control mechanisms, leaving people free to commit crime (Bursik & Grasmick, 1993). Such a breakdown in informal controls is likely to occur during periods of rapid social change, which tend to result in social disorganization and diminished cohesion and solidarity (Bursik & Grasmick, 1993; Park & Burgess, 1925/1967; Shaw & McKay, 1942). When applied to the issue of

trends in police murders across time, this perspective suggests that law enforcement officer killings are likely to be higher during periods of social disorganization.

The applicability of social disorganization and control theories to police murders has not been explicitly investigated. However, several studies have examined factors that shed light on the extent to which these perspectives enhance our understanding of police murders. Social disorganization indicators are generally not related to police murder trends as expected in that several studies have found either negative (Jacobs & Carmichael, 2002; Lester, 1978b, 1984) or null (Fridell & Pate, 1995) effects for population density on police murders. In a study of 1980s city-level data, Jacobs and Carmichael (2002) also found a negative relationship for residential segregation and no effect for female-headed households. Research on the effects of racial heterogeneity has also produced mixed results in that the impact of percentage of Blacks, non-Whites, and/or Hispanics on police murders has been reported as positive (Lester, 1978a, 1978b), negative (Bailey, 1982; Jacobs & Carmichael, 2002), null (Peterson & Bailey, 1988), or a combination of these (Bailey & Peterson, 1987; Chamlin, 1989). Perhaps most consistent with this theory is the finding that divorce rates, an indicator of social integration, positively affect police murder rates (Bailey & Peterson, 1994; Chamlin, 1989; Jacobs & Carmichael, 2002; Kaminski & Marvell, 2002; Peterson & Bailey, 1988).

Deterrence

Deterrence theories assume humans are logical, rational beings who exercise free will. Decisions are based on a utilitarian assessment of the relative weights of perceived costs and benefits linked with particular courses of action. To the extent that the costs outweigh the benefits, criminal behavior is deterred (Vold, Bernard, & Snipes, 2002). More traditional deterrence theory statements define costs primarily in terms of formal sanctions, asserting that punishments characterized by certainty, celerity, and severity are most likely to deter crime. However, more recent research highlights the importance of informal sanctions, as well (see, for example, Nagin & Paternoster, 1991).[2]

Deterrence is one perspective that has been applied to police murders. Leading the field, Bailey and Peterson have examined the deterrent effects of executions and the death penalty. Despite varied measures, they have consistently found no evidence that deterrence measures affect police murders (Bailey, 1982; Bailey & Peterson, 1987, 1994). Kaminski and Marvell (2002) also found no support for a death penalty effect, but they did find that the size of the prison population negatively affected police murders, suggesting some support for deterrence theory. Others have examined the deterrent effects of arrests on police murders but yielded inconsistent results (Chamlin, 1989; Fridell & Pate, 1995; Jacobs & Carmichael, 2002).

Summary

A review of the literature on police officer murders indicates previous research is largely characterized by a limited application of theory and the use of primarily descriptive and cross-sectional methodologies. In this study, we extend existing knowledge by using multivariate, econometric time-series regression techniques to study long-term trends in police murders and their correlates. We specifically draw on strain and economic deprivation, social disorganization and control, and deterrence perspectives in this endeavor.

Data and Method

Econometric and time series regression techniques are used to examine annual national-level U.S. data on police officers killed in the line of duty from 1947 to 1998.

Dependent Variable

Police murder rates were calculated using NLEOMF data as compiled by Kaminski and Marvell (2002). The data consist of the number of felonious line-of-duty deaths of full-time, part-time, and volunteer law enforcement officers with arrest power in the United States, including federal, state, local, and noncombat military police officers.[3] Following Kaminski and Marvell, police murder rates are the number of law enforcement officers killed per 100,000 persons in the U.S. population.[4]

Independent Variables

The impact of economic deprivation and strain is assessed with measures of economic conditions reflecting both absolute and relative deprivation. Unemployment and nonemployment[5] rates were calculated for persons 16 years of age and older using labor force participation data obtained from the Bureau of Labor Statistics (2003). The Gini index was included as a measure of family inequality, with higher values indicating greater levels of inequality. Data for 1947 to 1966 were taken from Danziger, Sandefur, and Weinberg (1994), and for 1967 to 1998, from the U.S. Census Bureau (2004b). Public assistance was included as a family poverty measure; it is defined as the number of families receiving welfare dollars from the Temporary Assistance for Needy Families program. Data for 1947 to 1970 were taken from Historical Statistics of the United States (HSUS; U.S. Census Bureau, 1975), and for 1971 to 1998, from volumes of the Statistical Abstract of the United States (SAUS), published annually by the U.S. Census Bureau and available online (www.census.gov/statab/www/). The consumer price index (CPI) was included as a measure of economic trends. CPI data using 1992 chained dollars were taken from Carroll (2000).

Social disorganization and control effects are assessed with family disruption, social integration, and population heterogeneity measures. Family disruption and population heterogeneity are expected to be linked with lower social integration and

weaker social controls, which in turn are likely to increase police murder rates. Divorce rates are the number of divorces per 1,000 persons in the population. Data were taken from the National Center for Health Statistics (NCHS, 1988) for 1947 to 1982 and from annual volumes of the SAUS for 1983 to 1998. Data on the percentage of families that are female-headed and that consist of married couples were taken from the U.S. Census Bureau (2004b). Population heterogeneity is measured by the size of the immigrant and non-White populations. Data on non-Whites and percentage of the U.S. population comprising newly admitted immigrants were taken from HSUS for 1947to 1970 and from volumes of the SAUS for 1971 to 1998.

Deterrence effects are measured with incarceration and execution data. Trends in these factors reflect the extent to which the costs of crime outweigh the benefits. To the extent that police murder is subject to the same utilitarian assessment as other crimes, it should be negatively affected by increases in incarceration and execution rates, although the deterrent effect may be lagged. Data on the number of executions in the United States were taken from the Bureau of Justice Statistics (2002) Web site and used to calculate rates per 100,000 persons. Data on the number of prisoners under federal or state jurisdiction were obtained from the U.S. Census Bureau (2004a).

Control Variables

Several control variables that previous research has found affect homicide rates are also included. Age structure of the population is controlled for using data on the percentage of the population ages 15 to 24 and 25 to 34 from NCHS (2002b). Previous research on age structure effects has produced mixed results, with some studies reporting a positive effect (Gurr, 1989; Land, McCall, & Cohen, 1990) and others a negative or null effect (Batton & Jensen, 2002; Steffensmeier & Haynie, 2000). The impact of alcohol on violence is controlled for as Parker and Cartmill (1998) note that (a) at the individual level, alcohol has disinhibiting effects on social behavior and (b) at the neighborhood level, alcohol outlets serve as "great attractors," or places that draw people looking to get away from the normal constraints of school, family, and work. Following previous research, cirrhosis death rates per 100,000 were used as a proxy for alcohol effects (Batton, 2004; Batton & Jensen, 2002; Jensen, 2000). Data were taken from HSUS for 1947 to 1970, from Vital Statistics and SAUS for 1971 and 1994, and from NCHS (2002a) for 1995 to 1998.[6] Finally, murder rates are included as a control for general trends in violence rates and the extent to which they affect police murder. Murder rate data were extracted from volumes of *Crime in the United States*, published annually by the FBI (www.fbi.gov/ucr/ucr.htm#cius).

Analytical Approach

To explore the correlates of historical trends in police murder rates, least-squares time series regression techniques are employed. Two problems that often plague time series analyses are autocorrelation and nonstationarity. Autocorrelation refers to the presence of correlated error terms, which is problematic because it "produces inflated

t-ratios, a false sense of confidence in the precision of the parameter estimates, and often leads to spurious attributions of significance to independent variables" (Hibbs, 1974, p. 257). Three autocorrelation tests were used: (a) Durbin-Watson statistic, (b) Box-Ljung *Q* statistics associated with the autocorrelation and partial autocorrelation functions, and (b) Breusch-Godfrey LM test (with up to three lags). Whereas the Durbin-Watson is restricted to first-order processes, the other two test for higher order processes and can be used with distributed lag models.

Nonstationarity refers to the presence of time dependent processes in the distribution of a series. This is problematic because spurious relationships, which occur if variables trend together across time, may be mistakenly identified as causal (Gujarati, 1995). Augmented Dickey-Fuller tests were used to test for stationarity and the presence of unit roots.[7] Several series contained unit roots in levels making them difference stationary processes, meaning stationarity could be achieved by differencing.[8] Others were trend stationary processes, meaning that they were stationary in levels and did not require differencing.

Differencing is often seen as a solution for the problems of autocorrelation and nonstationarity. However, it can be problematic as differencing a series that is trend stationary introduces a unit root, making it nonstationary (Cromwell, Labys, & Terraza, 1994). Furthermore, it changes the nature of the data (Jensen, 1997). Conceptually, researchers may start with a focus on historical trends but then analyze differenced data. This is problematic because the data represent annual fluctuations rather than historical trends (Jensen, 1997). When used to test theories of long-term historical change, it is not surprising that the theory is often disconfirmed. Often overlooked is that it has been disconfirmed by procedures that remove or adjust most of the history of the phenomenon to be explained (Batton & Jensen, 2002; Jensen, 1997).

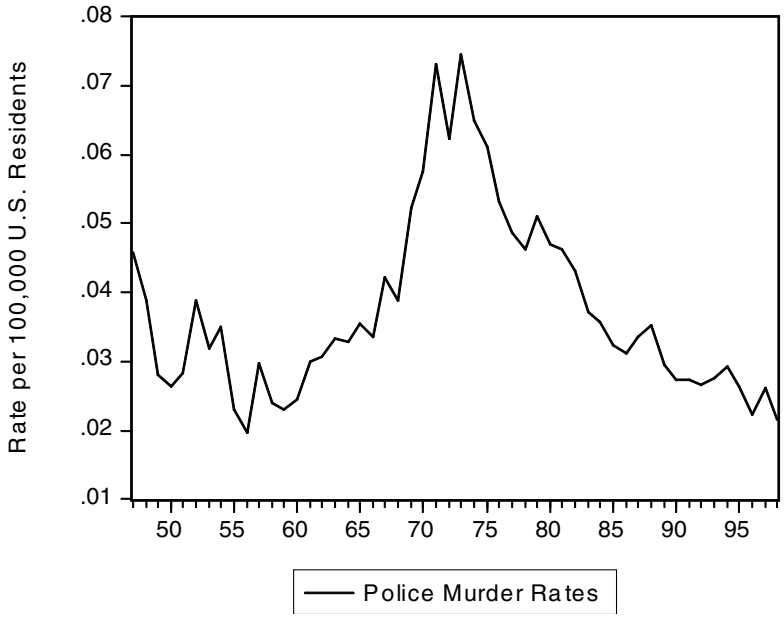
We analyze both level and logged differenced measures. Using levels, we attempt to model trend effects and eliminate autocorrelated error terms by including theoretically and historically relevant variables. Potential missing variables can often be discerned by inspecting the residuals plot for spans where the dependent variable is consistently over- or underestimated (Jensen, 2000). We also analyze differenced data to be consistent with convention. To stabilize the temporal variance of the series, the data were also logged (Devine, Sheley, & Smith, 1988).

Findings

Temporal Patterns in Police Murder

Police murder rates were initially plotted across time to discern the extent to which historical trends exist. As shown in Figure 1, police murder rates declined during the early years of the study period, dropping from a rate of .05 per 100,000 persons in 1947, when 66 officers were killed, to .02 in 1956, with 33 officers killed. From there, police murder rates increased sharply into the early 1970s, reaching .073 in 1971 and .075 in 1973, with 152 and 158 officers killed in each year, respectively. Police murder

Figure 1
Police Murder Rates per 100,000 Persons in the United States, 1947 to 1998



rates then began a long decline that continued throughout the remainder of the study period, reaching a low of .02 in 1998, with 58 officers killed.

Researchers have recently called attention to the conceptualization of time in historical research, arguing that the use of time as a means of merely chronologically ordering sample elements is ahistorical (Isaac & Leicht, 1997), the reason being that models spanning long time periods are presented as causally invariant as well as theoretically and historically undifferentiated (Batton & Jensen, 2002). In contrast, time should be treated as central to model conceptualization and analyses.

We address this issue using qualitative and quantitative approaches. First, we turned to the policing literature for changes in policy and practices that occurred during the study period. As a result of criticisms made in the mid-1960s by the President's Commission on Law Enforcement and Administration of Justice (1967) and the National Advisory Commission on Civil Disorders, the federal government began assuming more responsibility for improving police policies and practices (Wadman & Allison, 2004). With the 1968 founding of the Law Enforcement Assistance Administration (LEAA), financial assistance for training police recruits and benefits for both in-service and college education were provided. Additionally, millions of dollars were earmarked for improving police technology and safety (i.e., bulletproof vests) and for conducting police research (Walker, 1977).

Given the marked downturn in police murders that began in the early 1970s, it is likely that the increased attention and resources devoted to police safety, technology, and research played a role. As a group, law enforcement officers likely became better able to protect themselves from the dangers posed by offenders (Brown & Langan, 2001; Quinet et al., 1997). Not only did the widespread availability of body armor play a role, but so did training on police tactics, defensive skills, and encounters with armed offenders, among other things (Fridell & Pate, 1995; Kaminski & Martin, 2000; Quinet et al., 1997). Unfortunately, research on the impact of these advances has largely failed to find significant effects on police murders (Kaminski, 2004; Kaminski & Marvell, 2002).[9] According to Kaminski (2004), this is likely a function of (a) the absence of valid and reliable data on body armor usage, time (e.g., hours) devoted to defense training, and chemical agent use (e.g., pepper spray) by police and (b) both within- and across-agency variation in departmental policies governing these factors (Brown & Langan, 2001; Kaminski, 2004). When the rarity of police murders is also considered, it gives insight into the difficulty of explaining and predicting such statistically rare events.

The increased attention and resources devoted to policing likely had broad sweeping and lasting effects in terms of reducing the physical vulnerability of police. Given the pervasive impact of police safety measures, problems posed by the absence of valid and reliable data, and variation within and between agencies in policies regulating police behavior, we conceptualize time as "historical context." As Isaac and Leicht (1997) note, different periods are presumed structurally distinct. Time-as-context facilitates explanations of continuity within and discontinuity between periods. This approach requires that transitions be theorized but recognizes that they may be gradual and are not necessarily marked by specific events or occurrences.

A visual inspection suggests a transition in the early 1970s as this was the peak for police murder rates during the study period. To identify the transition point, a series of Chow breakpoint tests was conducted examining breakpoints between 1968 (the year LEAA was formed) and 1973, controlling for the effects of nonemployment, inequality, public assistance, inflation, murder rates, incarceration, executions, and alcohol consumption. Two of the transition points were statistically significant, 1969 (1947 to 1968, 1969 to 1998) and 1972 (1947 to 1971, 1972 to 1998). The latter was opted for as it most closely corresponds with the peak years in police murder rates, which were 1971 and 1973, with rates of .073 and .075 per 100,000 persons, respectively. Thus, the multivariate analyses look at two periods: 1947 to 1971 and 1972 to 1998. Because the study period is historically differentiated, the effects of predictor variables are allowed to vary temporally.[10]

Multivariate Findings

The results of the least squares models are contained in Table 1. Only the best fitting model developed for each dependent variable is presented.[11] In column 1, the level measures model indicates police murder rates are positively associated with nonemployment ($b = .813$, $a = .001$), inflation ($b = .006$, $a = .001$), and lagged execu-

Table 1
Least Squares Model Predicting Police Murder Rates Using Both Level (y_t) and Logged Differenced ($\log y_{t-1}$) Measures

	Police Murder Rate											
	Per 100,000 Population								Per 100,000 Officers			
	1947 to 1971				1972 to 1998				1972 to 1998			
	y_t	*SE*	$\log y_{t-1}$	*SE*	y_t	*SE*	$\log y_{t-1}$	*SE*	y_t	*SE*	$\log y_{t-1}$	*SE*
Constant	–.376***	.0950	–0.062	.038	–.251***	.068	–0.027	.015	–173.630**	53.964	–.024*	.010
Economic deprivation or strain												
Public assistance					–.000*[a]	.000[a]			–.004*	.002		
Gini index			5.616***	1.356	.250**[b]	.078	2.044*[b]	1.005	144.611*[b]	62.421		
Nonemployment	.814***	.2150	11.943***	3.405	.373*	.169			297.614*	134.468		
Inflation	.006***	.0010	3.889**	1.415								
Deterrence												
Executions (–1)	.350***	.0680										
Incarceration (–1)	–.001**	.0001	–2.261**	1.036								
Controls												
Alcohol			1.622***	.560	.004*	.002	1.381***	.451			.962*	.448
Murder rates					.004**	.002	.377**[b]	.155	3.800**	1.229	.394*[b]	.166
MA (1)							–.997**	.098			–.972***	.026
Adjusted R^2	.913		.680		.960		.555		.960		.517	
Durbin-Watson *d*	2.207		2.309		2.237		2.154		1.991		1.797	
Breusch-Godfrey LM test (three lags)												
F values	.269		1.234		1.321		1.358		.401		.722	
Obs*R^2	1.152		4.801		4.871		4.728		1.693		2.591	
Q statistics	OK		OK		OK		OK		OK		OK	
N	24		23		27		27		27		27	

Note: MA = moving average; Obs = observations.
a. Public assistance coefficient is –.00000516 and standard error is .00000249.
b. Lagged one year.
*p = .05. **p = .01. ***p = .001.

tions (b = .350, a = .001) for 1947 to 1971. Police murder rates are negatively associated with lagged incarceration rates (b = –.001, a = .01) for this period. The findings for the logged differenced model for this period, listed in column 2, are similar in that annual changes in police murder rates for 1947 to 1971 are positively related to changes in inequality (b = 5.616, a = .001), nonemployment (b = 11.943, a = .01), inflation (b = 3.889, a = .01), and alcohol (b = 1.622, a = .01) and negatively related to lagged incarceration rates (b = –2.261, a = .05). The adjusted R^2 values are .913 (i.e., levels model) and .680 (i.e., logged differenced model), both indicating a good model fit. In general, the autocorrelation tests indicate that it has been eliminated from both the levels and logged differenced models. However, one exception was the Durbin-Watson statistic (d = 2.309) for the logged differenced model, which fell in the inconclusive region (d_L = 2.080, d_U = 3.105).

Models based on level and logged differenced measures were also developed for the latter period (1972 to 1998) and are contained in columns 3 and 4 of Table 1, respectively. The findings of the levels model indicate trends in police murder from 1972 to 1998 are positively related to lagged inequality (b = .250, a = .01), nonemployment (b = .373, a = .05), murder rates (b = .004, a = .01), and alcohol (b = .004, a = .05). Police murder rates are negatively related to public assistance rates (b = –.000, a = .05). As before, the findings for the logged differences model are similar in that changes in police murder rates from 1972 to 1998 are positively related to lagged inequality (b = 2.044, a = .05), lagged murder rates (b = .377, a = .05), and alcohol (b = 1.381, a = .01). A moving average term (MA1) was included in this model as well. The adjusted R^2 values indicate a good model fit for the logged differenced model (R^2 = .555) and a better fit for the levels model (R^2 = .960). Autocorrelation tests generally indicate no autocorrelation is present in the models with the exception of the Durbin-Watson statistic (d = 2.237) for the levels model, which falls in the inconclusive region (dL = 2.139, dU = 2.996).

Population data were used as the base for police murder rates because data on the number of officers were not available for the entire study period. To check the reliability of this measure, regression models were run for police murder rates per 100,000 officers for the latter period (when the data were available). The results, contained in columns 5 and 6, are similar to those in columns 3 and 4. This is not surprising given the .98 correlation between the two police murder measures. Regardless of which police murder rate measure is used for 1972 to 1998, the results indicate the same variables are significant and in the same direction. A difference between the models developed for the two measures is that alcohol consumption dropped out of the levels model (column 5) and inequality dropped out of the logged differenced model (column 6). The significance level of both (in columns 3 and 4) had been close to .05. Their failure to remain significant further illustrates the sensitivity of small sample time series models.

Across- and Within-Period Comparisons

The results of the multivariate analyses indicate a great degree of similarity when the models based on disparate measures are compared for each period. Many of the factors associated with police murder rates from 1947 to 1971 in the levels model also had significant effects in the same direction in the logged differenced model. In both models, effects were identified for nonemployment, inflation, and incarceration. The two models for 1972 to 1998 are also similar to one another in that significant effects on police murder rates were found for nonemployment, murder rates, and alcohol.

It should be noted that differences between the levels and logged differenced models also exist within periods. For 1947 to 1971, executions negatively affected trends in police murder (i.e., y_t), but not annual changes in police murder (i.e., lny_{t-1}). Conversely, inequality and alcohol were significant predictors of annual fluctuations in police murder (i.e., lny_{t-1}) but not of long-term trends in this phenomenon (i.e., y_t). For 1972 to 1998, public assistance and inflation affected police murder trends (i.e., y_t) but not annual changes (i.e., lny_{t-1}). Except for a moving average term, all the factors in the logged difference model (i.e., lny_{t-1}) were also significant in the levels model (i.e., y_t).

Comparisons can also be made across time periods. Although indicators of economic deprivation and strain contributed to police murder in both periods, an inflation effect was found only for 1947 to 1971. Conversely, public assistance decreased police murder from 1972 to 1998 but not from 1947 to 1971. Deterrence theory indicators were also significant in both time periods, but temporal differences were detected. Whereas incarceration decreased police murder rates for 1947 to 1971, there was no effect for 1972 to 1998. Conversely, murder rates were associated with higher police murders for 1972 to 1998 but had no impact during the earlier period.

Discussion and Conclusions

This study focuses on historical trends in law enforcement officer murders in the United States. Time series regression techniques were used to examine trends across time (1947 to 1998), drawing on economic deprivation and strain, social disorganization and control, and deterrence theories. The findings of this study contribute to our understanding of police murders in important ways. They indicate that trends in police murder are characterized by two distinct periods in which the structural correlates vary. The findings also shed light on the relevance of three perspectives for understanding trends in police murder and suggest that their effects are to some extent historically specific.

Distinct Historical Periods

A major finding of this study is the existence of two distinct historical periods with respect to police murders. Beginning in the early 1970s, police murder rates began a long decline that persisted at least through the 1990s. The policing literature indicates that important changes in policing began to occur in the late 1960s and early 1970s as a

result of criticisms of the police (Walker, 1999). We assert that these changes initiated a transformation in the historical context of violent police-citizen encounters in the United States. Following Isaac and Leicht (1997), we conceptualize time as historical context, where periods are presumed structurally distinct and transitions require theorization. The shift in the direction of police murder rates around 1970 and the development of structurally distinct explanatory models for the earlier (1947 to 1971) and latter periods (1972 to 1998) support the time-as-historical-context approach.

We assert that declining police murder rates in the 1970s, 1980s, and 1990s were a function of the increased attention and resources devoted to police training, technologies, and research because of their effects on potentially lethal outcomes in police-citizen interactions. Although the LEAA was established in 1968, positive effects were probably not immediately felt in that it likely took a few years for advances in protective measures to be disseminated and incorporated into police training and practices. Therefore, we use 1972 as the transition point because of the lag in effects linked with communicating advances and distributing new technologies to police across the United States. Furthermore, reforms, training, and research have likely had ongoing, prolonged effects as opposed to a one-time impact. Thus, changes initiated in the 1960s and 1970s affected police murder rates during the next three decades.

One of the most important advances likely occurred with the introduction of bullet-proof vests (Kaminski, 2004). The adoption of body armor began in the early 1970s, which is consistent with research indicating a steady decline in police murders since 1973 (Kaminski & Marvell, 2002; Quinet et al., 1997). Although the lack of data has hindered research, body armor clearly has protective effects for officers struck in the torso by a bullet. Its protective effect may have even increased after time as vests have become more widely available and technologically advanced.

Also a result of the 1960s reforms, advancements in training likely reduced police murders. Little empirical evidence exists linking training to murder risk (Kaminski, 2004). However, it is argued that training reduces the likelihood of tactical errors that may result in injury or death (FBI, 1992) and that highly trained officers have more skills (e.g., mediation, defense tactics, armed and unarmed combat) that they can draw on in potentially violent confrontations (Kaminski, 2004; Kaminski & Martin, 2000). The effects are apt to be long lasting as advances in training are continually occurring.

A third factor that has likely contributed to declining police murder rates is advances in trauma and emergency medical care. As Unnithan, Huff-Corzine, Corzine, and Whitt (1994) note, the availability and administration of prompt medical care can be all that distinguishes between lethal and nonlethal outcomes. There have undoubtedly been technological and medical advances that have increased survival rates among the critically wounded, who may have died in the past.[12]

Although it is not possible to disentangle the effects of body armor, police training, or emergency medical care on the decline in police murder rates, data on violent police-citizen encounters indicate a drop in the proportion of lethal incidents. Data on assaults against the police indicate the proportion with lethal outcomes dropped more than 50% from 1978 to 1992, when it was .0018 and .0008, respectively.[13] The reduction in lethality is more obvious in changes in the nonlethal-to-lethal assault ratio. In

1978, there were 670.3 nonlethal assaults against officers for every lethal one; by 1998, that number had risen to 1,464.3. Looking only at gun-related incidents, the ratio of nonlethal to lethal outcomes started at 33.7 in 1978 and increased to a high of 80.8 in 1992. However, the ratio had dropped to 36.7 by 1998, indicating an increase in the lethality of gun-related incidents in the 1990s.

In addition to training and technological advances, the late 1960s and early 1970s were marked by reform as police behavior increasingly came under scrutiny, especially with respect to riots and racial conflicts (Walker 1977, 1999). A series of U.S. Supreme Court decisions resulted in police departments instituting reforms to control police behavior and to limit the discretionary use of authority by officers, especially with respect to search and seizure, interrogations, the use of deadly force, the handling of domestic violence, and high-speed pursuits. It was also at this time that policies were initiated to recruit more minority, female, and college-educated officers (Walker, 1999).

Finally, the long decline in police murder may be related to a reduction in violent police-citizen encounters (Quinet et al., 1997). Changes in policing since the 1960s have resulted in a more diverse police force with respect to sex and race and ethnicity, stricter rules governing the use of force, fairer grievance methods, and more recently, community policing techniques geared toward improving police-community relations (Walker, 1999). Although potentially important, data do not exist that would allow an empirical assessment of the impact of these changes.

Relevance of Theoretical Perspectives

Although previous research has generally not supported the deterrence perspective, we report partial support. More specifically, incarceration was associated with declining police murder rates from 1947-1971. To the extent that incarceration is a deterrent, a positive effect would have been more likely for the latter period (1972-1998) given the rising incarceration rates of the 1970s. Our findings are consistent with Kaminski and Marvell (2002), who found a negative effect for incarceration on police murder for 1932-1998. Counter to expectations, we found that police murder rates were positively associated with lagged executions. In sum, while some support for deterrence theory was found, the magnitude and duration of those effects are topics deserving of future research.

The divergence between the findings of this study and others concerning deterrence effects may involve the measures employed. We assessed deterrence using incarceration and executions, but others have used measures such as the death penalty or arrests. Bailey (1982) and colleagues (Bailey & Peterson, 1987, 1994) have repeatedly found no effect for the death penalty. The level of aggregation used in this study made it impossible to look at the same measure, but we did find a lagged, positive effect for execution rates on police murder for 1948 to 1972. Although this contrasts with Kaminski and Marvell (2002), who reported a null effect for executions on police murders from 1932 to 1998, the effect may have been period specific, as we found.

Based on the idea that arrests deter crime, arrest rates are often used as another deterrence measure in police murder research (Chamlin, 1989; Fridell & Pate, 1995; Jacobs & Carmichael, 2002). For similar reasons, researchers have also controlled for the effects of crime rates on police murder (Bailey & Peterson, 1987; Chamlin, 1989; Fridell & Pate, 1995; Jacobs & Carmichael, 2002; Peterson & Bailey, 1988). In this study, we controlled for the impact of violent crime on police murder. Consistent with Jacobs and Carmichael (2002), we found that murder in general was positively related to police murder, although the effect was historically specific (1972 to 1998).

Strain and economic deprivation theories were also examined in this study. Police murder rates were positively related to economic deprivation and inequality throughout the study period. It is likely that adverse economic conditions generate greater aggregate levels of anger, stress, and frustration, which in turn are translated into higher levels of violence and aggression. The negative emotions associated with deprivation and inequality may ultimately manifest themselves in violence toward the most visible representatives of the system, the police (Jacobs & Carmichael, 2002).

Although not the first to study economic deprivation and police murders, some of the measures used here are unique and deserve comment. First, to our knowledge, the impact of inequality on trends in police murder has not been previously examined using time series techniques. Consistent with Jacobs and Carmichael (2002),[14] we found that inequality increased police murder throughout the entire study period. However, they contrast with research finding no effect for the Gini index (with one exception)[15] in cross-sectional analyses of state-level data (Chamlin, 1989; Peterson & Bailey, 1988).

Also unique was the incorporation of nonemployment rates, which largely reflects the extent to which individuals have stopped participating in the labor force. As with inequality, nonemployment was associated with higher police murder rates throughout the entire study period. Poverty measures failed to register significant effects on police murders in preliminary analyses. This is partially consistent with previous research, which has reported either mixed (Bailey, 1982; Bailey & Peterson, 1987; Chamlin, 1989; Peterson & Bailey, 1988) or null (Jacobs & Carmichael, 2002) effects for poverty. Another departure from previous research was a positive but historically specific relationship (1947 to 1971) between inflation and police murder. This contrasts with Kaminiski and Marvell (2002), who identified a positive effect for 1932 to 1998.

Although evidence consistent with deterrence and economic deprivation explanations of police murder trends was identified in this study, no such evidence was found for social disorganization and control theories. The failure to identify effects may be at least in part because of the level of aggregation characterizing this study. It is likely that national-level data obscure important geographical variations in social disorganization that may be otherwise detected in state-, county-, or city-level data.

Directions for Future Research

Researchers have rarely examined police murder using time series techniques, with a few notable exceptions (Bailey & Peterson, 1994; Kaminski & Marvell, 2002; Southwick, 1998). Additional research is needed to examine how police murder trends are affected by social structural factors not examined in this study (e.g., legal changes, educational attainment). Also needed is research considering alternative modes of periodization. On a related note, pooled time series research is needed to capture both spatially and temporally variable effects, such as analyses of city-level data to discern the effects of social disorganization on police murder across time.

Although this study attempted to examine the impact of economic deprivation, deterrence, and social disorganization perspectives, research is needed to assess the explanatory power of other criminological perspectives (e.g., conflict theory). Given its emphasis on economic deprivation and inequality, conflict theory may provide a useful framework for explaining trends in police murder across time.

Finally, research on organizational-level factors associated with police murders is needed. To the extent that the lethality of police-citizen assaults is related to officer training, safety gear availability, and departmental policies, agency-level variation should be detectable. Data on some of these indicators are available through the office of Law Enforcement Management and Administrative Statistics and could be merged with FBI data on law enforcement officers killed and assaulted.

Notes

1. For a comprehensive review of research on police murders, see Kaminski (2004).

2. For a review of deterrence theory literature, see Paternoster and Bachman (2001).

3. Kaminski and Marvell (2002, p. 188) note several sources were consulted to verify that officer deaths involved felony circumstances. Cases were excluded if the suspect lacked intent (e.g., officer died of a heart attack during a pursuit). It should also be noted that the eight officers killed in the 1995 Oklahoma City bombing were counted as one in the data. Presumably this was done because most police murders are single-victim incidents, and such an incident would skew the data for that year. We found the rates and trends were similar regardless of whether the victim count was eight (.029) or one (.026) for this incident. Like Kaminski and Marvell, we count one victim for the Oklahoma City incident. Although it made little difference here, others should be cognizant of how multiple-victim incidents affect rates for any one time unit. For more information, see Kaminski and Marvell (2002, p. 188).

4. Data on the number of police officers are not available dating back to 1947. Thus, following Kaminski and Marvell (2002), we calculate rates per 100,000 persons in the population. However, for the latter period, we also examine murder rates per 100,000 full-time officers to check the reliability of the primary dependent variable measure.

5. *Unemployment* refers to persons who are part of the labor force and out of work but are seeking employment. *Nonemployment* refers to those not seeking employment and reflects the extent to which people have stopped participating in the labor force for both legitimate (e.g., retirement) and illegitimate (e.g., underground economy) pursuits.

6. Preliminary models also included controls for the availability of emergency medical care and wartime and military service variables. However, they were eliminated from final models because of nonsignificant effects.

7. One problem with unit root tests is a bias against rejecting the null hypothesis of a unit root and nonstationarity (Kwiatkowski, Phillips, Schmidt, & Shin, 1992).

8. Differencing involves creating a new series by subtracting the value of a variable at $time_t$ from $time_{t-1}$. The values no longer reflect levels of a phenomenon but instead are change scores (i.e., the amount of change from one year to the next).

9. See Kaminski (2004) for a comprehensive discussion of this issue.

10. Although breaking the data into two periods makes sense historically, it renders the models less stable in a statistical sense as they are highly dependent on the time points included in each period. Whether a variable is found significant could change with the inclusion or exclusion of one or two time points. Given the vulnerability to change of small sample models, this approach is not without its disadvantages.

11. In time series and econometric modeling, it is common to eliminate nonsignificant variables in the process of developing a well-fitting model. The null effects of social disorganization and control measures are why they do not appear in Table 1.

12. We attempted to examine the effects of trauma care using the number of hospital beds per 1,000 persons, a measure of the availability of medical resources. No effects were identified; thus, it was eliminated from the model. This measure may lack the precision necessary to detect emergency care effects on lethality in analyses of national annual-level data, especially those spanning more recent years, where people tend to have better access to care than in decades past.

13. Assault data for 1978 to 1998 were taken from volumes of *Law Enforcement Officers Killed and Assaulted*, compiled by the FBI and available online (www.fbi.gov/ucr/ucr.htm#leoka). The data are for those agencies that reported data for all 12 months.

14. Jacobs and Carmichael (2002) measured inequality using the Black:White income ratio.

15. Chamlin (1989) found a negative inequality (i.e., Gini index) effect on police murder in one of three models; null effects were identified for the other two models.

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