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THE DETERRENT EFFECT OF THE DEATH PENALTY FOR MURDER IN OHIO: A TIME-SERIES ANALYSIS

WILLIAM C. BAILEY*

FEW, IF ANY, QUESTIONS have been the subject of longer and more heated discussion than the role of capital punishment in the criminal justice system in this country. Abolitionists and retentionists have long debated numerous constitutional and other questions concerning the death penalty, including: (1) does the death penalty deter capital crimes; (2) does capital punishment constitute cruel and unusual punishment; (3) does the death penalty discriminate against the poor, racial and cultural minorities; (4) does capital punishment actually induce capital crimes; (5) is the penalty inevitably administered capriciously and arbitrarily; and (6) does the death penalty disrupt and distort the orderly administration of the criminal justice system?¹ Of the relevant issues, none has been the subject of more controversy or polarized opinion in the criminology literature in recent years than the issue of the deterrent effect of the death penalty for the crime of murder.²

The deterrence controversy has not been solely confined to academic circles but rather has also played a role in a number of death penalty cases recently brought before the United States Supreme Court. For example, in *Furman v. Georgia*,³ in which the Court held five to four that the "imposition and carrying out of the death penalty constitutes cruel and unusual

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¹ For a detailed discussion of the legal, moral and other questions that have been long debated about the role of capital punishment in the criminal justice system, see T. SELLIN, *CAPITAL PUNISHMENT* (1967); CAPITAL PUNISHMENT IN THE UNITED STATES (H. Bedau & C. Pierce eds. 1976); *THE DEATH PENALTY IN AMERICA* (H. Bedau ed. 1967).

² The vast majority of previous empirical investigations have failed to show the death penalty to be an effective deterrent to murder. See, e.g., OHIO LEGISLATIVE SERV. COMM'N, *CAPITAL PUNISHMENT* (1961); T. SELLIN, *THE DEATH PENALTY* (1959); Bailey, *Deterrence and the Death Penalty for Murder in Utah: A Time Series Analysis*, 5 J. CONTEMP. L. 1 (1978); Bailey, *Imprisonment Versus the Death Penalty as a Deterrent to Murder*, 1 L. & HUMAN BEHAVIOR 239 (1977); Bailey, *Murder and the Death Penalty*, 65 J. CRIM. L. C. & P. S. 416 (1974); Black & Orsagh, *New Evidence on the Efficiency of Sanctions as a Deterrent to Homicide*, 58 SOC. SCI. Q. 616 (1978); Bowers & Pierce, *The Illusion of Deterrence in Isaac Ehrlich's Research on Capital Punishment*, 84 YALE L.J. 187 (1975); Forst, *The Deterrent Effect of Capital Punishment: A Cross-State Analysis of the 1960's*, 61 MINN. L. REV. 743 (1977); Schuessler, *The Deterrent Effect of the Death Penalty*, 284 ANNALS 54 (1952); Sutherland, *Murder and the Death Penalty*, 51 J. AM. INST. CRIM. L. & C. 522 (1925); Passell & Taylor, *The Deterrent Effect of Capital Punishment: Another View* (1975) (Discussion paper 74-7509, Columbia University).

In contrast, two recent investigations have presented evidence suggesting that the certainty of execution may provide an effective deterrent to murder. Ehrlich, *The Deterrent Effect of Capital Punishment: A Question of Life or Death*, 65 AMER. ECON. REV. 397 (1975); Yunker, *Is the Death Penalty a Deterrent to Homicide? Some Time-Series Evidence*, 5 J. BEHAVIORAL ECON. 45 (1976). Both the Ehrlich and Yunker studies have come under very serious criticism because each suffers from a number of important theoretical and methodological shortcomings. See notes 28-44 *infra* and accompanying text.

³ 408 U.S. 238 (1972).

punishment in violation of the Eighth and Fourteenth Amendments,"⁴ the deterrence question was given explicit recognition. Although the efficacy of the death penalty as a deterrent to murder did not prove to be of major significance in the decision in *Furman*, the Supreme Court did give some attention to the deterrence question, with Chief Justice Burger's dissent complaining about the unfortunate lack of clear empirical evidence on this question and implying the need for more definitive studies on this important issue.⁵

In the aftermath of *Furman* a new round of death penalty research was launched by social scientists, with the Supreme Court receiving briefs and hearing oral arguments in a number of capital punishment cases⁶ in which the

⁴ *Id.* at 239-40. While in *Furman* each of the Supreme Court Justices delivered a separate opinion, a majority of the Court agreed that the death penalty is "cruel and unusual" punishment because it is imposed infrequently and under no clear standards. *Id.* at 238. Justice Brennan and Justice Marshall felt the death penalty to be "cruel and unusual" no matter how administered. *Id.* at 257, 314. Justice Stewart and Justice White found the death penalty "cruel and unusual," the rationale being that it was so rarely and capriciously exacted that it could not serve any social purpose advanced to justify it. *Id.* at 306, 310. Justice Douglas concurred that the death penalty was "cruel and unusual," because as applied it is "pregnant with discrimination" and "not compatible with the idea of equal protection of the laws." *Id.* at 257.

⁵ *Id.* at 395-96 (Burger, C.J., dissenting). See also the dissent of Justice Powell. *Id.* at 454-55 (Powell, J., dissenting).

⁶ On July 2, 1976, the Supreme Court of the United States announced rulings in five cases, upholding three discretionary death penalty statutes in *Gregg v. Georgia*, 428 U.S. 153 (1976); *Proffitt v. Florida*, 428 U.S. 242 (1976); and *Jurek v. Texas*, 428 U.S. 262 (1976). At the same time the Court invalidated two others on the ground that these two statutes imposed mandatory capital punishment, in *Woodson v. North Carolina*, 428 U.S. 280 (1976) and *Roberts v. Louisiana*, 428 U.S. 325 (1976). In striking down North Carolina's mandatory death penalty for first degree murder, the majority of the Court in *Woodson* concluded that "the respect for humanity underlying the Eighth Amendment . . . requires consideration of the character and record of the individual offender and the circumstances of the particular offense as a constitutionally indispensable part of the process of imposing the ultimate punishment of death." 428 U.S. at 304. The North Carolina statute was found to impermissibly treat all persons convicted of a designated offense not as uniquely individual human beings, but as members of a faceless, undifferentiated mass to be subjected to the blind infliction of the death penalty. *Id.* For the same reasons as detailed in *Woodson*, the Court also invalidated Louisiana's mandatory death penalty for first degree murder in *Roberts v. Louisiana*, 428 U.S. at 331-36.

In *Gregg*, the Court ruled that "the punishment of death does not invariably violate the Constitution." 428 U.S. at 169. A plurality of the Court argued that first degree murder is a grave crime and it cannot be maintained that the penalty of death is disproportionate in relation to the crime. "It is an extreme sanction, suitable to the most extreme of crimes," but only providing that the sentencing jury in a capital case has its discretion suitably directed and limited so as to minimize the risk of wholly arbitrary and capricious action. *Id.* at 188-95. In two other cases decided on the same day, the death penalty statutes for murder in Florida and Texas were upheld by the Court upon its holding in *Gregg*. *Proffitt v. Florida*, 428 U.S. at 250-60; *Jurek v. Texas*, 428 U.S. at 270-77.

As Hugo Bedau has recently pointed out in an analysis of the Court's rulings in *Gregg*, *Jurek*, and *Proffitt*, the common denominator that emerges from these cases is that capital punishment is not unconstitutional as long as the statutes under which it is imposed provide, in one way or another, for: "(1) opportunity to put before the court information about the defendant to assist in reaching the sentencing decision, (2) special emphasis on the mitigating factors that affect the defendant's blameworthiness, (3) common standards to guide trial courts in death sentence cases, and (4) review of every death sentence by a state appellate court." H. BEDAU, *THE COURTS, THE CONSTITUTION, AND CAPITAL PUNISHMENT* 113 (1978).

The Court's rulings concerning mandatory capital punishment resulted in the subsequent invalidation, either by court decision or by legislative repeal, of the death penalty statutes of twenty states and in the reduction to life imprisonment of the death sentences of approximately 395 inmates in these states. NAACP LEGAL DEFENSE & EDUC. FUND, INC., *DEATH ROW*, U.S.A. 1 (Oct. 23, 1979).

findings of these recent studies were of major concern. To a greater degree than in *Furman*, the Court did direct its attention to the evidence on deterrence and the death penalty in at least some of these cases. In *Gregg v. Georgia*,⁷ for example, the Court concluded that "although some of the studies suggest that the death penalty may not function as a significantly greater deterrent than lesser penalties, there is no convincing empirical evidence either supporting or refuting this view."⁸ Nevertheless, and without citing any empirical evidence in support of its view, the Court went on to conclude that for many situations — for example, murder for hire and murder by a life-term prisoner — "the death penalty undoubtedly is a significant deterrent."⁹

As both Bedau¹⁰ and Zeisel¹¹ have recently argued in examinations of *Gregg*, one can only wonder at the logic of the Supreme Court in concluding that the empirical evidence on deterrence and the death penalty is simply inconclusive, but at the same time, and without any empirical evidence, concluding that the death penalty undoubtedly is a significant deterrent in some cases. In all fairness the Court is not alone in its view about the inconclusiveness of the available evidence. For example, after an exhaustive review of the early and more recent death penalty investigations, the Panel on Research on Deterrence and Incapacitative Effects of the National Research Council, National Academy of Science, concluded that the results of the analyses on capital punishment "provide no useful evidence on the deterrent effect of capital punishment."¹² What is required, the Panel concluded, are investigations that avoid the many methodological limitations that have plagued this line of research.¹³

Despite the fact that most criminologists and other social scientists have long concluded that the death penalty does not deter murder (or other capital crimes), the deterrent effect of capital punishment has once again become a topic of lively debate in the professional literature.¹⁴ Beginning with a 1975 paper by Isaac Ehrlich which appeared in the *American Economic Review*, a number of death penalty investigations focusing specifically upon the issue of deterrence have recently appeared in leading criminology, economics and law journals.¹⁵ In these investigations, researchers have attempted to build

See Black, *Due Process for Death*, 26 CATH. U.L. REV. 1 (1976) and England, *Capital Punishment in the Light of Constitutional Evolution*, 52 NOTRE DAME LAW. 596 (1977) for background and analyses of the 1976 capital punishment cases.

⁷ 428 U.S. 153 (1976).

⁸ *Id.* at 185.

⁹ *Id.* at 185-86.

¹⁰ Bedau, *New Life for the Death Penalty*, 223 NATION 144 (1976).

¹¹ Zeisel, *The Deterrent Effect of the Death Penalty: Facts v. Faiths*, 1978 SUP. CT. REV. 317.

¹² NAT'L RESEARCH COUNCIL PANEL ON RESEARCH ON DETERRENT AND INCAPACITATIVE EFFECTS, NAT'L ACADEMY OF SCIENCES, *DETERRENCE AND INCAPACITATION: ESTIMATING THE EFFECTS OF CRIMINAL SANCTIONS ON CRIME RATES* 9 (1978).

¹³ *Id.* at 62-63.

¹⁴ For critiques of the anti-death penalty attitude held by most social scientists, see Jeffery, *Criminal Behavior and Learning Theory*, 56 J. CRIM. L.C. & P.S. 294 (1965) and Tullock, *Does Punishment Deter Crime?*, 36 PUB. INTEREST 103, 108 (1974).

¹⁵ Bailey (1977), *supra* note 2; Bailey (1974), *supra* note 2; Black & Orsagh, *supra* note 2; Bowers & Pierce, *supra* note 2; Ehrlich, *supra* note 2; Yunker, *supra* note 2.

upon some of the important limitations of the classic studies by Edwin Sutherland, Thorsten Sellin, Karl Schuessler and others¹⁶ and to bring more theoretical and methodological sophistication into this line of inquiry.

While these recent investigations have addressed a number of questions neglected in earlier studies, this renewed research effort has far from settled the deterrence question. To the contrary, these studies have brought some investigators to diametrically opposed conclusions and have raised additional questions about deterrence and the death penalty.

One of these questions and the issue to be examined in this investigation, concerns the extent to which results and conclusions drawn from these recent studies can be generalized to Ohio's experience with capital punishment. Because the classic as well as the more recent death penalty investigations have typically examined either (1) the relationship between cross-state variation in execution rates and homicide rates for selected years or (2) the relationship between execution rates and homicide rates longitudinally over time for nationally aggregated data, it remains unclear how well the results of these studies can be generalized to individual jurisdictions.¹⁷ Before examining this question further and the methodology of the present investigation, it would seem of value to briefly summarize the findings of both the classic and the more recent death penalty investigations.

I. REVIEW OF THE LITERATURE

A. *Classic Investigations*

The investigations from which most social scientists have traditionally drawn a negative conclusion about the deterrent effect of capital punishment have been primarily of two sorts: (1) longitudinal studies of states' homicide rates before and after the abolition and/or restoration of the death penalty and (2) cross-sectional analyses of yearly homicide rates for retentionist and abolitionist states. Contrary to the deterrence hypothesis, these studies have typically shown (1) homicide rates to be higher, and not lower, in death penalty jurisdictions and (2) no significant change in the level of homicides that can be attributed to abolition or restoration of capital punishment.¹⁸

In addition, at least two cross-state examinations of the relationship between the certainty of execution and homicide rates in retentionist states have failed to show a significant inverse relationship between these two factors as the deterrence argument would predict. To the contrary, for the period 1937 to 1941 examined by Schuessler,¹⁹ only a very slight negative

¹⁶ OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2; T. SELLIN, *supra* note 2; Schuessler, *supra* note 2; Sutherland, *supra* note 2.

¹⁷ One study conducted by the Ohio Legislative Service Commission in 1961 examined longitudinally the relationship between execution rates and homicide rates in Ohio for the period 1909 to 1958. OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2. This study suffers from a number of serious shortcomings which render its conclusions highly suspect. See notes 23-27 *infra* and accompanying text.

¹⁸ See, e.g., T. SELLIN, CAPITAL PUNISHMENT 122-24, 135-38 (1967); Bedau, *Deterrence and the Death Penalty: A Reconsideration*, 61 J. CRIM. L.C. & P.S. 534 (1971); Schuessler, *supra* note 2, at 57; Sutherland, *supra* note 2, at 522.

¹⁹ Schuessler, *supra* note 2.

association ($r = -.26$, $r^2 = .067$)²⁰ was found between average execution rates and average homicide rates for 41 death penalty jurisdictions.²¹ Likewise, in a replication of Schuessler's study for the five year periods preceding 1967 and 1968, this author also found only a very slight inverse relationship between execution rates in retentionist states and rates of first degree murder ($r = -.137$, 1967; $r = -.194$, 1968) and between execution rates and rates of murder and non-negligent manslaughter combined ($r = -.166$, 1967; $r = -.039$, 1968).²² These findings lead both Schuessler and this author to conclude that the evidence for these years does not support the claim that the death penalty — certainty of execution — provides an effective deterrent to murder.

In another investigation which is of particular interest here, the Ohio Legislative Service Commission in 1961 reached a similar conclusion from its analysis of the relationship between changes in execution rates and homicide rates in Ohio for the period of years from 1909 to 1959.²³ Examining overlapping two-year periods between these dates (1909-1910, 1910-1911 . . . 1958-1959), the Commission found the certainty of the death penalty and homicide rates to be positively associated ($r = .48$), and not negatively associated as the deterrence hypothesis would predict. This analysis led the Commission to conclude that there is no evidence that executions have any discernable negative effect on homicide rates.²⁴

While the findings of the Ohio study are generally consistent with the results of many previous investigations, a few important methodological questions can be raised about this investigation. First, in examining the deterrence hypothesis, the Ohio Legislative Service Commission made use of an atypical and biased measure of the certainty of the death penalty for murder. In contrast to most previous investigators, who have commonly operationalized the certainty of execution as the number of executions for murder divided by the number of reported homicides,²⁵ the Commission defined execution rates as the number of executions for murder divided by the population of the state of Ohio.²⁶ Because of this operationalization and the

²⁰ Pearson Product Moment Correlation (r) is a statistical procedure designed to measure the strength of the association between two variables. The r correlation can range from 0.0 (which usually indicates no association between the two variables) to ± 1.00 (which indicates a perfect association between the two variables). The larger the r coefficient, the stronger the relationship between the independent variable (executions) and the dependent variable (homicides rates). Thus if their correlation is positive, it indicates that an increase in executions is associated with an increase in homicides. If the r coefficient is negative, it indicates that higher execution rates are associated with lower homicide rates.

When the r coefficient is squared (r^2), it provides an indication of the proportion of the variation in the dependent variable (which can range from 0.0% to 100%) that be accounted for by the independent variable. A more detailed discussion of the Pearson Product Moment Correlation can be found in most elementary statistics texts. See, e.g., H. BLALOCK, *SOCIAL STATISTICS* 376-85 (2d ed. 1972).

²¹ Schuessler operationalized his execution rate measure as the number of executions for murder per 1,000 homicides. Schuessler, *supra* note 2, at 59-60.

²² Bailey (1974), *supra* note 2, at 422.

²³ OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2.

²⁴ *Id.* at 46.

²⁵ Bailey (1978), *supra* note 2; Bailey (1977), *supra* note 2; Bailey (1974), *supra* note 2; Black & Orsagh, *supra* note 2; Schuessler, *supra* note 2.

²⁶ OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2, at 46-47.

facts that (1) the number of homicides is positively correlated with the size of the state's population and (2) the number of executions is positively correlated with the number of homicides in the state each year, it is certainly not surprising that the Commission found execution rates and homicide rates to be positively associated. What remains unclear as a result of this difficulty is to what extent the Commission's findings might have been altered had it used a more conventional and theoretically appropriate measure of the certainty of execution in its analysis.

A second major limitation of the Ohio study results from the Commission's choice to solely examine the bivariate relationship between execution rates and homicide rates,²⁷ thus ignoring other possibly important etiological factors that influence homicide rates. Because homicide rates have been repeatedly shown to be associated with a number of socioeconomic and demographic factors such as nonwhite population, urban population, unemployment, etc. which were not incorporated into the Commission's study, the possible spuriousness of its findings (even if a more appropriate execution rate measure had been utilized) cannot be ignored. That is, the Commission's findings may simply be a statistical artifact resulting from consideration of alternative and important determinants of changes in Ohio's homicide rates from 1909 to 1959. Until this matter is examined, which is a major focus of the present investigation, the relevance of the Ohio Legislative Service Commission study will have to remain an open question.

B. *Recent Investigations*

As noted above, beginning with a recent and widely known paper by Ehrlich which appeared in a leading economics journal,²⁸ there have been a handful of rather complex multivariate analyses of the death penalty in the last few years. In each of these studies there have been attempts to overcome some of the limitations of previous investigations and thus derive a more sound understanding of the deterrent effect of the death penalty for murder.

Ehrlich's research examined the certainty of execution-homicide rate relationship for the period of years from 1933 to 1969, while simultaneously introducing the following sociodemographic and law enforcement factors into the analysis as control variables: (1) percent of homicides cleared by

²⁷ *Id.*

²⁸ Ehrlich, *supra* note 2. To illustrate the attention that Ehrlich's research has received, before his article was published in *The American Economic Review* an unpublished version of his paper, Ehrlich, *The Deterrent Effect of Capital Punishment: A Question of Life and Death* (1973) (Working Paper No. 18, National Bureau of Economic Research), was cited at length and with praise by the Solicitor General of the United States in his Brief for the United States as Amicus Curiae at 35-38 in *Fowler v. North Carolina*, 285 N.C. 40, 203 S.E.2d 803 (1974), *vacated on this issue*, 428 U.S. 904 (1976). Copies of Ehrlich's study were also delivered by the Solicitor General to the Court.

The attention the Ehrlich study has received is also well evidenced by the number of critiques and challenges his research has received in the professional literature. See Bailey (1977), *supra* note 2; Bailey (1974), *supra* note 2; Baldus & Cole, *A Comparison of the Work of Thorsten Sellin and Isaac Ehrlich on the Deterrent Effect of Capital Punishment*, 84 YALE L.J. 170 (1975); Bowers & Pierce, *supra* note 2; Forst, *supra* note 2; Peck, *The Deterrent Effect of Capital Punishment: Ehrlich and his Critics*, 85 YALE L.J. 359 (1976); Zeisel, *supra* note 11, at 329-37; Passell & Taylor, *supra* note 2.

arrest; (2) percent of those charged with homicide who were convicted; (3) number of executions for murder for year $(t + 1)$ as a percent of the aggregate number of convictions for year t ; (4) fraction of the civilian labor force unemployed; (5) percent of population 14-24 years of age; (6) per capita income; (7) nonwhite population; (8) civilian population; (9) per capita expenditures, including national defense, of all governments; (10) per capita expenditures on police, lagged by one year; and (11) chronological time.²⁹

Of greatest concern here are Ehrlich's findings for the certainty of execution variable. His analysis led him to conclude that "an additional execution per year over the period in question may have resulted, on average, in 7 to 8 fewer murders."³⁰

While these findings are in striking contrast to the results of previous investigations,³¹ Ehrlich's research has not gone unchallenged and continues to be a source of debate more than four years since its publication. Because it is beyond the scope of the present investigation to thoroughly critique Ehrlich's study, comment is confined to only its most important limitations.

First, in examining the effect of the executions, Ehrlich fails to differentiate between "death penalty" and "abolition" jurisdictions in estimating annual probabilities of execution. This, of course, is terribly misleading since the probability of execution in abolitionist states is zero.

Second, the validity of Ehrlich's statistical model rests upon the assumption that the relationship between executions and homicides is the same throughout the period 1933 to 1969. Both the study by William Bowers and Glen Pierce³² and the study by Peter Passell and John Taylor³³ which examine varying periods between 1933 and 1969 rejected the assumption of temporal homogeneity. In fact, their replication of the Ehrlich study for various periods between 1933 and 1969 consistently revealed a positive association between executions and homicide,³⁴ and not a negative association as Ehrlich reports.

Third, Ehrlich measured his execution, homicide and control variables on a *national level*, thus ignoring the tremendous variation in these factors from state to state. Again, such a procedure fails to differentiate between "abolitionist" and "death penalty" states. More importantly, it does not take into consideration the substantial variation in the levels of homicide (in both types of states) and execution practices (in retentionist jurisdictions) from state to state. Nor does Ehrlich take into consideration variation from state to state on his control variables,³⁵ which further renders his analysis highly suspect.

Fourth, because Ehrlich uses nationally aggregated data in his analysis, it

²⁹ Ehrlich, *supra* note 2, at 409.

³⁰ *Id.* at 414.

³¹ OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2; T. SELLIN, *supra* note 2; Bailey (1974), *supra* note 2; Schuessler, *supra* note 2; Sutherland, *supra* note 2.

³² Bowers & Pierce, *supra* note 2, at 197-99.

³³ Passell & Taylor, *supra* note 2, at 4-6.

³⁴ Bowers & Pierce, *supra* note 2, at 198-99; Passell & Taylor, *supra* note 2, at 4-6.

³⁵ Ehrlich, *supra* note 2, at 409.

remains totally unclear to what extent, if any, his findings can be generalized to individual jurisdictions for the 1933 to 1969 period. Unfortunately, Ehrlich fails to even speculate about this matter.

In sum, while Ehrlich should be commended for attempting to bring more sophistication into death penalty investigations, on the basis of his research Passell and Taylor conclude that "it is prudent neither to accept nor reject the hypothesis that capital punishment deters murder."³⁶ Moreover, it must be emphasized that at least two independent replications of Ehrlich's research have shown nationally aggregated execution rates and homicide rates to be positively, and not negatively, associated.³⁷

In another investigation James Yunker³⁸ further examined the execution-offense rate relationship by: (1) utilizing an alternative measure of the certainty of execution, *i.e.*, the actual number of executions per year for varying periods from 1933 to 1972; (2) considering solely annual unemployment rates as a control variable; and (3) considering a zero and three-year time lag model between executions and homicide rate in testing the deterrence hypothesis.³⁹

Yunker's research, like Ehrlich's, provides support for the deterrence hypothesis. For the period 1960 to 1972, which are the only years where Yunker concludes that the execution-homicide rate relationship can be properly examined,⁴⁰ he reports for the three-year time lag model an unstandardized regression coefficient of $B = -2.636$ ($t = -11.075$)⁴¹ and concludes that "one execution will deter 156 murders."⁴² Interestingly, although the relationship between executions and homicide ($B = -6.685$) is more substantial when these two variables are examined within the same year without a time lag, Yunker rejects this within year model as preferable on the basis of its lower t value of -3.315 . Because he is examining population data for preselected years, however, one can only speculate why Yunker places so much weight upon statistical inference and not descriptive measures of association in his analysis.⁴³

³⁶ Passell & Taylor, *supra* note 2, at 12.

³⁷ See notes 32-34 *supra* and accompanying text.

³⁸ Yunker, *supra* note 2.

³⁹ Yunker examines the relationship between executions and homicides within the same year to explore the hypothesis that the death penalty has an immediate (within the year) deterrent effect on offense rates. He further explores the hypothesis that "it takes a certain amount of time for the fact of executions to affect the mentalities of potential criminals, so that the aggregate number of executions in the relatively proximate past [the past three years] has more impact than the current level [of executions on homicide rates]." *Id.* at 51.

⁴⁰ From Yunker's discussion of his findings for the various time periods from 1933 to 1972 (1933-1959, 1933-1972, 1960-1972), it is unclear why he chose to emphasize the results for the 1960-1972 period and largely to ignore the results for the other time periods. No sound theoretical or methodological justification is provided for this decision. It is of particular interest to note that had Yunker chosen to emphasize these additional findings, he would have had to *reject* the hypothesis that the death penalty provides an effective deterrent to murder. For the years 1933 to 1959, executions and homicide rates are positively associated ($B = .540$) and not negatively related as the deterrence hypothesis predicts. For the period 1933 to 1972, executions and homicide rates are negatively associated ($B = -.148$) as predicted, but the relationship is very slight and is not statistically significant. See *id.* at 60-63. For a discussion and interpretation of the B coefficient, see the Appendix to this article at pages 71-75 *infra*.

⁴¹ For a discussion and interpretation of the t and B statistics, and a brief introduction to multiple regression analysis, see the Appendix to this article.

⁴² Yunker, *supra* note 2, at 65.

⁴³ For a discussion of the use of statistical inference techniques like the t test with population

More importantly, Yunker's research suffers from the same objections raised above about Ehrlich's study: (1) he aggregates his execution, homicide and unemployment data on a national and not a state level, and (2) he fails to differentiate between abolition and retentionist jurisdictions. In addition, he chooses to ignore his less conclusive findings for the period 1933 to 1959 where executions were at a more substantial level than for the years 1960 to 1972 where levels of execution were reduced.⁴⁴ Accordingly, and at best, Yunker's reported findings only reflect a limited and atypical period of our national experience with the death penalty.

II. SUMMARY OF THE EVIDENCE

The research summarized above fails to provide a consistent pattern of findings on the deterrent effect of the death penalty for murder. With the exception of the recent studies by Ehrlich and Yunker, both cross-state and longitudinal analyses have typically failed to provide support for the hypothesis of a substantial inverse relationship between the certainty of the death penalty (execution rates) and homicide rates. Most typically, these two variables have been found to be either positively associated, or only slightly negatively associated. In addition, because of the difficulties noted above with the Ehrlich and Yunker studies, their contrary findings have to be viewed with extreme caution.

Despite the importance of the above investigations in contributing to a better understanding of the deterrent effect of the death penalty, the methodology employed in these studies makes it extremely difficult to generalize their findings to individual jurisdictions in this country. For example, while cross-sectional analyses of states for selected years have failed to show variation in execution rates and homicide rates to be substantially inversely related, these investigations do not address the relationship between variation (changes) in execution rates and homicide rates over time within individual jurisdictions. Similarly, while longitudinal studies of nationally aggregated data for execution rates and homicide rates for various time periods also fail to provide general support for the deterrence argument, it is uncertain whether national patterns may be generalized to individual states' experiences with the death penalty.

In sum, until the relationship between the certainty of the death penalty and homicide rates is examined over time within individual jurisdictions, the findings of the studies summarized above can only be suggestive at best for individual states. Unfortunately, this question has been largely ignored by previous death penalty investigators, with the only analysis of this type being

data, and for units of observation (years) that Yunker acknowledges are quite atypical during the time period in which he would like to make a statistical inference, see the Appendix to this article.

Interestingly, had Yunker based his decision about the superiority of the time lagged versus non-lagged executions model on the size of the regression coefficients for the 1960 to 1972 period ($B = -2.636$, $B = -6.685$, respectively), and not on the basis of the size of the t values for the two models ($t = -3.315$, $t = -11.075$, respectively), he would have been forced to reject the deterrence hypothesis for the death penalty because the t value for non-lagged executions is not statistically significant. See Yunker, *supra* note 2, at 61.

⁴⁴ This is an important consideration to keep in mind in assessing the merits of Yunker's study. A common complaint voiced by proponents of the death penalty is that in recent years the level of executions for murder has been so reduced that the death penalty has been "robbed" of its deterrent effect. For a discussion of this argument, see Jeffery, *supra* note 14, at 299.

conducted for Ohio. However, even this investigation, which was conducted by the Ohio Legislative Service Commission, fails to adequately address the deterrence question due to the important methodological limitations discussed above.⁴⁵ As a result, the deterrent effect of the certainty of the death penalty for murder in Ohio remains a question yet to be systematically examined.

III. THE PRESENT INVESTIGATION

To avoid the difficulties discussed above and to better understand the deterrent effect of the death penalty in Ohio, the present study will examine the hypothesis of a significant inverse relationship between the certainty of execution and homicide rates in Ohio for the years 1910 to 1962. Five sociodemographic factors associated with homicide rates are introduced in the analysis as control variables in considering the relationship between executions and homicide rates: (1) proportion male population; (2) proportion population 20 to 40 years of age; (3) proportion nonwhite population; (4) proportion urban population; and (5) percent unemployment. By considering these sociodemographic variables, it will be possible both to control for the effect of these factors on changes in homicide rates during the above period, and thus better isolate the effect of the death penalty on homicide, and to compare the relative effect of the sociodemographic factors versus executions on changes in homicide rates. A description of the execution rate, homicide rate, and sociodemographic variables, and the method of analysis follows below.

A. Certainty of Execution

To construct a measure of certainty of the death penalty, figures were required on the number of executions for homicide in Ohio each year. In previous investigations⁴⁶ execution figures have typically been obtained from the Federal Bureau of Prison's *National Prisoner Statistics* series. It was not possible to use those data here because execution figures are available from this source only from 1930. As a result, a certainty measure was constructed with alternative execution data compiled by Teeters and Zibulka.⁴⁷ The Teeters-Zibulka Inventory, recently published in its entirety by Bowers,⁴⁸ provides a detailed summary of executions for homicide in Ohio for the period of years from 1885 to 1963.

Similar to previous investigations,⁴⁹ certainty of the death penalty (execution rates) was operationally defined as the total number of executions for homicide for each year divided by the total number of reported homicides each year. This procedure resulted in an execution rate value for each year that can theoretically range from zero (0) to unity (1.0). A value of zero would

⁴⁵ See notes 23-27 *supra* and accompanying text.

⁴⁶ Bailey (1977), *supra* note 2; Black & Orsagh, *supra* note 2; Bowers & Pierce, *supra* note 2; Ehrlich, *supra* note 2; Forst, *supra* note 2; Schuessler, *supra* note 2; Yunker, *supra* note 2; Passell & Taylor, *supra* note 2.

⁴⁷ Teeters & Zibulka, *Executions Under State Authority — An Inventory*, in *EXECUTIONS IN AMERICA* 199 (W. Bowers ed. 1974).

⁴⁸ *Id.*

⁴⁹ See note 25 *supra* and accompanying text.

indicate that there were no executions for homicide in the state during the year, while a value of one would indicate an equal number of homicides and executions during the year.⁵⁰

B. Homicide Rates

While first degree murder⁵¹ is generally the only form of homicide punishable by death, deterrence investigators have typically operationalized this offense as either (1) homicide, making use of figures from the National Center for Health Statistics,⁵² or (2) murder and non-negligent manslaughter, making use of statistics from the *Uniform Crime Reports*.⁵³ This practice has been necessitated by the fact that there are no alternative statistics available specifically on capital homicides in this country (or for Ohio). As a result of

⁵⁰ Although it would have been of interest here to also examine the conditional probability of execution (given arrest, conviction and/or imprisonment for murder) as a measure of the certainty of the death penalty, such an analysis could not be conducted due to the unavailability of necessary arrest, conviction, and imprisonment data for many of the years considered here. Only for two years (1950, 1960) during the time period examined in this study (1910-1962) are figures available from Federal Bureau of Prisons publications on the number of convicted murderers that were imprisoned in Ohio. No figures are available from either Ohio or federal authorities on the annual number of murder arrests or convictions for the 1910 to 1962 period.

⁵¹ For the time period under consideration in this study (1910-1962), Ohio provided for the death penalty or life imprisonment for murder in the first degree, the last effective statute being section 2901.01 of the Ohio Revised Code:

No person shall purposely, and either of deliberate and premeditated malice, or by means of poison, or in perpetrating or attempting to perpetrate rape, arson, robbery, or burglary, kill another.

Whoever violates this section is guilty of murder in the first degree and shall be punished by death unless the jury trying the accused recommends mercy, in which case the punishment shall be imprisonment for life.

OHIO REV. CODE ANN. § 2901.01 (Page 1954) (repealed 1974).

In 1972 murder in the first degree was replaced by the offense of aggravated murder as the only form of capital homicide in Ohio:

(A) No person shall purposely, and with prior calculation and design, cause the death of another.

(B) No person shall purposely cause the death of another while committing or attempting to commit, or while fleeing immediately after committing or attempting to commit kidnapping, rape, aggravated arson or arson, aggravated robbery or robbery, aggravated burglary or burglary, or escape.

(C) Whoever violates this section is guilty of aggravated murder, and shall be punished as provided in section 2929.02 of the Revised Code.

OHIO REV. CODE ANN. § 2903.01 (Page 1975).

At the present time Ohio is without a death penalty for murder. The United States Supreme Court struck down Ohio's death penalty law, OHIO REV. CODE ANN. §§ 2929.03-.04, on July 3, 1978 in *Lockett v. Ohio*, 438 U.S. 586 (1978), and *Bell v. Ohio*, 438 U.S. 637 (1978). For a discussion of the *Lockett* and *Bell* rulings, and subsequent legislative developments, see notes 77-86 *infra* and accompanying text.

⁵² The U.S. Public Health Service includes in its homicide category all deaths resulting from an injury purposely inflicted by another person, with intent to kill not being required to classify a death as a homicide. Homicide data are compiled by the Public Health Service from microfilm copies of original death certificates gathered by the agency from throughout the country. U.S. DEP'T OF HEALTH, EDUCATION & WELFARE, PUBLIC HEALTH SERV., HOMICIDE IN THE UNITED STATES: 1950-1964 SERIES 20, No. 6 (1967).

⁵³ The Federal Bureau of Investigation collects from local police departments murder rates for Ohio and other jurisdictions of the country. The Bureau offense category of murder and non-negligent manslaughter includes all willful felonious homicides, as distinguished from deaths caused by negligence. U.S. DEP'T OF JUSTICE, FED. BUREAU OF INVESTIGATION UNIFORM CRIME REPORTS: CRIMES IN THE UNITED STATES — 1977 at 7 (1978).

this practice, investigators have had to assume, whether they use law enforcement or public health figures, that the ratio of first degree murders to total homicides is a constant from state to state and year to year, so that the more inclusive homicide data provide a reasonably good indicator of capital offenses. While the author's findings for 1967 to 1968, which show a similar relationship between states' execution practices and rate of first degree murder, and Federal Bureau of Investigation figures for homicide would appear to support this assumption, its validity remains unknown for other years.⁵⁴

In the absence of theoretically appropriate data on first degree murder, homicide figures for Ohio were secured from the Federal Bureau of Investigation's *Uniform Crime Reports* for the years 1933-62 and National Center for Health Statistics Compilation for the period 1910-32. Although the homicide offense category used by the Bureau more closely corresponds to first degree murder than that used by the U.S. Public Health Service,⁵⁵ reasonably complete Federal Bureau of Investigation's figures are only available from the year 1933. As a result, to extend the analysis to two prior decades, public health service figures were used as an index of capital homicides for this period.

C. Sociodemographic Variables

For the purpose of extending the analysis beyond a simple bivariate examination of the relationship between executions and homicide, five sociodemographic factors associated with homicide were introduced into the analysis as control variables: (1) proportion urban population; (2) proportion nonwhite population; (3) percent unemployment; (4) proportion male population; (5) proportion population 20 to 40 years of age. Data for these variables were gathered from census figures.⁵⁶

While it was the intention of this study to examine the multivariate relationship between executions, the sociodemographic factors and homicide for each year between 1910 and 1962, this was not possible. Unfortunately, complete control data was only available for the six census years (1910, 1920, 1930, 1940, 1950, 1960). Rather than restricting the analysis to only these years, the two-year periods immediately preceding and immediately following each census year were also examined, and the respective census figures were used

⁵⁴ Bailey (1974), *supra* note 2. Note that the Ohio Legislative Service Commission also made use of criminal homicide data in its analysis, but not figures for first degree murder. OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2, at 47.

⁵⁵ See notes 52-53 *supra*.

⁵⁶ The sociodemographic variables were chosen on the basis of their use, or the use of similar variables, in previous deterrence and death penalty investigations. See Bailey (1977), *supra* note 2; Black & Orsagh, *supra* note 2; Bowers & Pierce, *supra* note 2; Ehrlich, *supra* note 2; Passell & Taylor, *supra* note 2; Yunker, *supra* note 2. By considering the same, or similar, sociodemographic variables, it will thus be possible to better compare the findings of this study with those of previous investigations.

The sociodemographic data were secured from the following: U.S. DEP'T OF COMMERCE, BUREAU OF THE CENSUS, CENSUS OF THE POPULATION: 1960 (1964); CENSUS OF THE POPULATION: 1950 (1953); ABSTRACT OF THE SIXTEENTH CENSUS OF THE UNITED STATES (1943); ABSTRACT OF THE FIFTEENTH CENSUS OF THE UNITED STATES (1933); ABSTRACT OF THE FOURTEENTH CENSUS OF THE UNITED STATES (1923); and U.S. DEP'T OF COMMERCE & LABOR, BUREAU OF THE CENSUS, THIRTEENTH CENSUS OF THE UNITED STATES (1914).

as the best available estimate for the control variables for these pre-census and post-census periods.⁵⁷

D. Method of Analysis

The execution, sociodemographic and homicide variables were fit into a multiple regression analysis,⁵⁸ with three models of the certainty of execution-homicide rate relationship being examined. To test the possible immediate deterrent effect of capital punishment on homicide, the relationship between the execution and offense rate variables was first examined within the same year. This model rests upon the assumption that the general public, including would-be killers, is more affected (deterred) by its *impression* of current levels of homicide and executions than by more distant former levels of execution.

Second, the execution-offense relationship was examined by building in a one-year time lag between execution rates (year t-1) and homicide rates (year t). Using this procedure, executions for 1909 were compared to homicides for 1910, and executions for each year were then compared with homicide rates for each following year through 1962.

Third, to examine the possibility that execution rates not only may influence homicide rates, but that homicide rates may also influence the level of use of the death penalty (execution rates), a two-stage analysis procedure was utilized.⁵⁹ Homicide rates for the previous year (t-1) were first regressed against execution rates for each year (t), and then homicide rates for each year (t) were regressed against the resulting residual execution rates for year t, controlling for the sociodemographic variables.

In considering each of the three models of the execution rate-homicide rate relationship, two homicide measures are utilized. First, as with most longitudinal studies, homicide rates for each of the individual years are used as a measure of the dependent variable. By using this measure, the comparisons of present findings with those of previous studies are facilitated. Second, average homicide rates for two-year periods $[(\text{years } t + t+1)/2]$ are

⁵⁷ To illustrate, census figures for 1920 were used as estimates of the control variables in examining the execution-offense rate relationship for 1918, 1919, 1920, 1921, and 1922. This procedure was followed for each of the six pre-census and post-census periods (with the exception of the pre-census years of 1908 and 1909 where accurate execution and homicide data were not available), thus yielding a total of 28 years where the execution-homicide relationship could be examined longitudinally for the state. In the absence of a sound theoretical rationale, we chose not to interpolate figures for the control variables for the remaining inter-census years.

⁵⁸ See the Appendix to this article for a discussion of multiple regression analysis, and see also the statistics resulting from this technique that are reported in Tables 1-6, pages 76-81 *infra*.

⁵⁹ To illustrate how execution rates may influence the level of homicides and also how the level of homicide may influence the level of use of the death penalty, consider the following example. Community A, with a low level of homicides during year (t-1), may respond to this situation with a low level of executions during year t. If the level of homicides does not change in community A from year (t-1) to year t, the relationship between execution rates and homicide will be positive. Conversely, community B, with a high level of homicides during year (t-1), may respond by increasing the level of executions during year t. If the level of homicides in community B is not immediately reduced within the year t, then the association between executions (year t) and homicides (year t) will be positive. While in both of these types of situations executions may be accomplishing a deterrent effect to some degree, responses to homicides like those noted here would confound the certainty-rate relationship by introducing "positive pressure" into a correlation analysis between executions and homicide rates.

used as an additional measure of the dependent variable.⁶⁰ This type of homicide measure has also been used in some previous death penalty investigations⁶¹ and has two advantages over the former measure: (1) it adds greater stability to the homicide index by reducing the effect of measurement error; and (2) it permits a better examination of the immediate (year t) as well as the possible delayed (year $t+1$) deterrent effect of executions on homicide.

IV. FINDINGS

Table 1⁶² reports the results of the analysis where execution rates and homicide rates are examined within the same years (top half of the table) and execution rates for each year are compared with mean homicide rates [(year $t + t+1$)/2] for two-year periods (lower half of the table). In each analysis the findings are very comparable when both homicide measures are utilized.

As noted above, consistent with the deterrence hypothesis one would expect a significant inverse (negative) relationship between the certainty of execution and homicide rates. Neither analysis provides support for this hypothesis. When execution rates and homicide rates are examined within the same year, the execution coefficient ($B = -.0450$) falls in the predicted negative direction but is not statistically significant ($F = .070$).⁶³ Rather, only a very slight trade off is observed between these two variables, with a one percent increase in executions only being associated with about 4.5 one-hundredth of a person reduction in the homicide rate.⁶⁴ Likewise, when mean homicide rates are used as a measure of the dependent variable, the trade off between executions and homicide is also very slight ($B = -.0367$), and not statistically significant ($F = .111$). In this analysis a one percent increase in the certainty of execution is associated with only about 3.7 one-hundredth of a person reduction in the homicide rate.

Examination of the standardized regression coefficients (beta weights) further illustrates the insignificant effect of executions on homicide rates.⁶⁵ Of the six independent variables considered, the certainty of execution ranks last in importance in each analysis behind the sociodemographic variables as a determinant of homicide. Judged by the size of the beta values, proportion male population proves to be the best predictor of homicide, followed by the age and proportion urban population variables. The proportion nonwhite population and percent unemployment variables follow next, although the F values show nonwhite population not to be significantly associated with either measure of homicide.

Table 2⁶⁶ reports the results of the analysis when a one-year time lag is built

⁶⁰ With this homicide measure, execution rates for 1910 are compared with mean homicide rates for 1910 and 1911, and so forth, ending with execution rates for 1962 being compared with mean homicide rates for 1962 and 1963.

⁶¹ OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2; Bailey (1978), *supra* note 2; Bailey (1977), *supra* note 2.

⁶² See page 76 *infra*.

⁶³ For a discussion and interpretation of the B and F statistics, see the Appendix to this article.

⁶⁴ For a discussion and interpretation of the beta statistics, see the Appendix to this article.

⁶⁵ *Id.*

⁶⁶ See page 77 *infra*.

in examining the relationship between execution rates (year t-1) and homicide rates (year t). This analysis is simply a replication of that reported in Table 1, but with the substitution of a new execution rate measure.

The findings exhibited in Table 2 almost exactly parallel the results of the earlier analysis for both the execution and sociodemographic variables. Again, the execution coefficients (B values) are of a negative sign when both homicide rates (-.0452) and mean homicides (-.0156) are considered, but they are very slight in magnitude and are not statistically significant. For neither measure of the dependent variable is a one percent increase in the certainty of execution associated with as much as a 5.0 one-hundredth of a person reduction in the homicide rate.

As before, these findings reject the deterrence hypothesis of a significant inverse relationship between the certainty of the death penalty and homicide rates. Rather, the beta results reported in Table 2 (as in Table 1) indicate that changes in the sociodemographic conditions in the state, with the exception of the insignificant nonwhite population variable ($F = 1.495$, $F = 1.942$), are far more important determinants of changes in homicide rates than the certainty of the death penalty.

As discussed above,⁶⁷ our third model of the relationship between the certainty of the death penalty and homicide takes into consideration the possibility that both execution rates may influence homicide rates (deterrence) and levels of homicide may influence levels of use of the death penalty. To examine this question, homicide rates (year t-1) were first regressed against execution rates (year t), and then homicide rates (year t), and mean homicide rates [(year t + (t+1))/2] were regressed against residual execution rates. This analysis is simply a replication of the two previous analyses (Tables 1 and 2), but with the substitution of a new residual execution rate measure. Results are reported in Table 3.⁶⁸

Once again, Table 3 reveals a pattern of finding very similar to the two previous models. While residual execution rates and homicide rates are negatively associated, the relationship is slight and not statistically significant for either homicide measure. When mean homicide rates are used as a measure of the dependent variable, the unstandardized coefficient shows a one percent increase in the certainty of the death penalty to be associated with about a 7.9 one-hundredth ($B = -.0788$) of a person reduction in the homicide rate. In slight contrast, the B coefficient (-.3012) is somewhat more substantial when homicide and execution rates are examined within the same year. Here a one percent increase in the certainty of the death penalty is associated with about a 3.0 tenths of a person reduction in the homicide rate. Even this finding must be viewed with extreme skepticism, however, due to the insignificant F value (.649) associated with the execution coefficient.

As before, examination of the standardized beta coefficients also indicates the insignificance of the execution rate variable. A comparison of the beta values shows executions to rank last in importance of the variables considered. With the exception of the nonwhite variable (beta = -.9227, $F = 2.134$), each of the remaining sociodemographic factors proves to be

⁶⁷ See notes 58-61 *supra* and accompanying text.

⁶⁸ See page 78 *infra*.

significantly related to both homicide rate measures, with each of these variables being better predictors of homicide than the certainty of execution (beta = $-.0583$, $F = .649$).

A. *Nonlinearity of the Execution-Homicide Rate Relationship*

The analysis to this point has solely considered the possible linear relationship between execution rates (and the sociodemographic variables) and homicide rates. The possibility exists, however, that the relationship between these variables is actually nonlinear and that the above analysis is accordingly biased.⁶⁹ To test this possibility, log transforms were performed on both homicide measures, and each of the three execution rate-homicide rate models were reconsidered.⁷⁰ Results of this analysis are presented in Tables 4 through 6.

Table 4⁷¹ reports the findings when execution rates for each year are regressed against transformed homicide rates during the year and transformed mean homicide for two-year periods.

The findings in Table 4 are comparable to those of the earlier analysis

⁶⁹ The analysis reported in Tables 1-3 rests upon the assumption that a one unit (percent) increase in execution rates will have the same magnitude effect on homicide rates, regardless of the level of executions, *i.e.*, the execution-homicide rate relationship is linear. For example, the linear analysis assumes that an increase in execution rates from five to ten percent will have the same proportional effect on homicide rates as an increase in execution rates from ten to fifteen percent. Likewise, the linear statistical model assumes that the *rate* of increase or decrease in homicide rates is of the same magnitude for the full range of the execution variable.

While linear models are commonly used in social science research, and often will approximate the form of the relationship between predictor and dependent variables, there has been some speculation that the relationship between the certainty of legal sanctions and offense rates is actually nonlinear. Charles Tittle and Alan Rowe, for example, argue that the probability of punishment (in this case the certainty of the death penalty) must reach a critical, but unknown, level before legal sanctions can achieve a significant deterrent effect on offense behavior (in this case homicide rates). Tittle & Rowe, *Certainty of Arrest and Crime Rates: A Further Test of the Deterrence Hypothesis*, 52 Soc. Forces 456 (1974). Conversely, the possibility exists that once the certainty of the death penalty reaches some unknown level, additional increases in execution rates will not achieve a greater deterrent effect on homicide rates, *i.e.*, execution rates may reach a point of diminishing returns at some level.

Although Tittle and Rowe are concerned with the possible non-linear relationship between arrest rates and felony rates, a number of deterrence and death penalty investigations have explored the possible nonlinear relationship between executions and homicides and the hypothesis that the certainty of execution must reach a certain level (a tipping point) before execution rates will achieve a significant deterrent effect on homicide rates. See note 70 *infra*.

To test the possible nonlinear relationship between execution rates and homicide rates in Ohio, log transforms were performed on the homicide rate variables. This has been the procedure followed in previous deterrence and death penalty studies. See note 70 *infra*. Accordingly, it will thus be possible to compare the findings of these studies with the results of the present investigation for Ohio.

⁷⁰ The log analysis reported in Tables 4-6 is simply a replication of that which appears in Tables 1-3, but with the substitute of transformed homicide rates. Accordingly, it will be possible to compare the respective findings reported in Tables 1-3 with those in Tables 4-6 to determine if a linear or non-linear model better describes the relationship between execution rates (and the sociodemographic variables) and homicide rates.

Log transforms have also been used in previous deterrence and death penalty investigations to test the linearity (non-linearity) question. See Bailey (1978), *supra* note 2; Bowers & Pierce, *supra* note 2; Ehrlich, *supra* note 2; Passell & Taylor, *supra* note 2. With the exception of the Ehrlich study, these investigations have failed to find support for the deterrence hypothesis for the death penalty, but the possible nonlinear relationship between execution rates and homicide rates remains unknown for Ohio for the time period examined in the present investigation.

⁷¹ See pages 79-81 *infra*.

when the same execution measure was used, *e.g.* Table 1. First, consistent with the deterrence hypothesis, the partial regression coefficients are of a negative sign when homicide rates and mean rates are considered ($B = -.0042$, $B = -.0036$, respectively). They fail to reach statistical significance, however, with the F values being very low ($F < .05$). Second, compared to the sociodemographic variables, the beta results again show execution rates to be the least adequate predictor of yearly ($-.0118$) and mean ($-.0104$) homicide rates. Third, and somewhat in contrast to the earlier findings, each of the sociodemographic variables proves to be significantly related to homicide rates, with the beta coefficients showing proportion nonwhite population to be the best predictor of offense rates.

Table 5⁷² exposes a very similar pattern of findings when execution rates lagged by one-year ($t-1$) are regressed against the transformed homicide variables.

Like Tables 2 and 4, the execution rate coefficients are negative for yearly ($B = -.0038$) and mean homicide rates ($B = -.0021$), but the coefficients are slight and are not statistically significant. In addition, the beta coefficients again show the certainty of the death penalty ($\text{beta} < -.01$) to be the least adequate predictor of homicide, with the proportion nonwhite ($\text{beta} > -1.6$) being the best predictor of both homicide rates.

To round out the analysis, transformed homicide rates were regressed against residual execution rates (as used in Table 3), with results being reported in Table 6.⁷³

As before, the execution variable proves to be negatively associated with both yearly ($B = -.0431$) and mean ($B = -.0061$) offense rates, but the coefficients are slight and are not statistically significant. This analysis further demonstrates each of the sociodemographic variables to be more strongly associated with homicide, with proportion nonwhite population again proving to be the best predictor of homicide rates ($\text{beta} = -1.8336$) and mean homicide rates ($\text{beta} = -1.5938$).

In sum, examination of transformed homicide rates (Tables 4-6) resulted in some different findings from the earlier analysis (Tables 1-3) for the sociodemographic variables. Whereas proportion male population proved to be the best predictor of homicide rates (while proportion nonwhite population was not found to be significantly related to homicide rates), proportion nonwhite population was found to be the factor most strongly associated with log homicide rates. Consistently throughout each stage of the analysis, however, execution rates and homicide rates were not found to be significantly related as the deterrence hypothesis predicts. Moreover, of the variables considered, certainty of execution consistently proved to be the least adequate predictor of homicides.

V. SUMMARY

A. Statistical Conclusion

This investigation has examined an important but largely neglected

⁷² See page 80 *infra*.

⁷³ See page 81 *infra*.

question concerning capital punishment in Ohio, namely, the deterrent effect of the certainty of execution on homicide rates. Considering 28 years during the period 1910 to 1962, three models of the relationship between execution rates and homicide rates were considered, with selected sociodemographic factors being introduced into the analysis as control variables. In each stage of the analysis, the deterrence hypothesis of a significant inverse relationship between the certainty of execution and homicide rates was tested.

Consistent with the findings of most previous cross-sectional investigations of states and longitudinal examinations of nationally aggregated data,⁷⁴ the instant analysis fails to provide support for the deterrence hypothesis for Ohio. Rather, this study consistently revealed only a very slight, nonsignificant negative association between the certainty of execution and offense rates when each execution rate-homicide rate model was examined and when two measures of homicide were utilized.

In addition, throughout the analysis each of the following sociodemographic factors consistently proved to be better predictors of homicide than the certainty of execution: proportion male population, proportion population 20-40 years of age, proportion nonwhite population, percent urban population, percent unemployment. Although the results for these sociodemographic variables were found to vary somewhat in the multivariate linear and nonlinear analyses (proportion male population was found to be the best predictor of homicide in the linear analysis, and proportion nonwhite population in the nonlinear analysis), the standardized beta coefficients for execution rates were very consistent.⁷⁵ Comparison of the beta values for the execution variable and the least adequate sociodemographic predictor of homicide rates shows the *least adequate sociodemographic variable*, on average, to be more than a 95 percent better predictor of homicide rates than the certainty of executions. Or put differently, the execution beta coefficients only average about five percent the size of the beta values for the sociodemographic variable least strongly associated with homicide rates.

These findings lead to the same conclusion that has been repeatedly drawn from numerous previous investigations.⁷⁶ The evidence for Ohio provides no support for the argument that the certainty of the death penalty provides an effective deterrent to homicide. Rather, execution rates and homicide rates prove to be largely independent factors, with offense rates being a response to the changing demographic characteristics and socioeconomic conditions of the state. Accordingly, while a number of justifications can and have been provided for the use of the death penalty for murder (including retribution, permanent incapacitation, normative validation, etc.), Ohio's experience with capital punishment during the last six decades does not support retentionist arguments based upon deterrence.

⁷⁴ OHIO LEGISLATIVE SERV. COMM'N, *supra* note 2; T. SELLIN, *supra* note 2; Bailey (1978), *supra* note 2; Bailey (1977), *supra* note 2; Bailey (1974), *supra* note 2; Black & Orsagh, *supra* note 2; Bowers & Pierce, *supra* note 2; Schuessler, *supra* note 2; Sutherland, *supra* note 2; Passell & Taylor, *supra* note 2.

⁷⁵ No fully satisfactory explanation can be provided to answer why the findings (relative size of the beta weights) for the proportion nonwhite population variable differ in the linear and nonlinear analysis. However, these mixed results are not of concern in assessing the affect of the variable of primary interest in this investigation, namely, the certainty of the death penalty.

⁷⁶ See note 74 *supra*.

B. Application to Legislative Action

On July 3, 1978, the Supreme Court of the United States struck down Ohio's death penalty statute, Ohio Revised Code § 2929.03-.04, in *Lockett v. Ohio*⁷⁷ and *Bell v. Ohio*,⁷⁸ holding that the Ohio law was unconstitutional because it did not allow broad enough consideration to be given to mitigating factors in sentencing.⁷⁹ The Court in *Lockett* observed that the "Eighth and Fourteenth Amendments require that the sentencer, in all but the rarest kind of capital case, not be precluded from considering as a mitigating factor any aspect of the defendant's character or record and any of the circumstances of the offense that the defendant proffers as a basis for a sentence less than death."⁸⁰ The *Lockett* and *Bell* decisions spared the lives of 101 convicted murderers on Ohio's death row.⁸¹

Since the *Lockett* and *Bell* decisions, Ohio has been without the death penalty for aggravated murder. Immediately after the Supreme Court's ruling in these cases, efforts were begun to revise the death penalty law to comply with the Court's above objection to the Ohio statute. On February 15, 1979, Amended Substitute House Bill 74⁸² was introduced

to amend sections 2903.01, 2929.02, 2929.03, 2929.04, 2929.41, 2953.02, and 2967.13, and to enact sections 2929.021, 2929.05, and 2929.06 of the Revised Code to provide for sentencing in some capi-

⁷⁷ 438 U.S. 586 (1978). Sandra Lockett was convicted on April 3, 1975, of aggravated murder with aggravating specifications, *i.e.*, the murder was committed to escape apprehension for, and while committing or attempting to commit, aggravated robbery. Lockett was sentenced to death pursuant to statute, OHIO REV. CODE ANN. §§ 2929.03-.04 (Page Supp. 1975). 438 U.S. at 589-94. The Ohio court of appeals and the Ohio Supreme Court affirmed her conviction. *Id.* at 587.

Lockett made various challenges to the validity of her conviction, including an attack on the constitutionality of the death penalty statute on the ground that it did not give the sentencing judge a full opportunity to consider mitigating circumstances in capital cases as required by the eighth and fourteenth Amendments. *Id.* at 602. For the permissible statutory mitigating factors to be considered by the sentencing judge in determining a sentence of death for aggravated murder, see OHIO REV. CODE ANN. § 2929.04(B) (Page Supp. 1975), set out at note 79 *infra*.

⁷⁸ 438 U.S. 637 (1978). Willie Lee Bell was convicted of aggravated murder with a specification that it occurred during a kidnapping, and was sentenced to death. The conviction was affirmed by the Ohio court of appeals and the Ohio Supreme Court. 438 U.S. at 639-42. As in *Lockett*, petitioner Bell contended that the Ohio death penalty statute, OHIO REV. CODE ANN. § 2929.03 (Page Supp. 1975), "violated his rights under the Eighth and Fourteenth Amendments because it prevented the sentencing judge from considering the particular circumstances of his crime and aspects of his character and record as mitigating factors." 438 U.S. at 642.

⁷⁹ The Ohio law required that once a defendant was found guilty of aggravated murder, OHIO REV. CODE ANN. § 2903.01 (Page Supp. 1978), *see* note 51 *supra*, with at least one of the aggravating circumstances contained in OHIO REV. CODE ANN. § 2929.04(A) (Page Supp. 1975), the death penalty would be imposed under *id.* § 2929.03 (E), unless:

considering the nature and circumstances of the offense and the history, character, and conditions of the offender, one or more of the following is established by a preponderance of the evidence: (1) the victim of the offense induced or facilitated it; (2) it is unlikely that the offense would have been committed, but for the fact that the offender was under duress, coercion, or strong provocation; (3) the offense was primarily the product of the offender's psychosis or mental deficiency, though such condition is insufficient to establish the defense of insanity.

Id. § 2929.04(B)

⁸⁰ 438 U.S. at 604. For more detailed analyses of the *Lockett* and *Bell* decisions, see Note, *Constitutional Criminal Law — The Role of Mitigating Circumstances in Considering the Death Penalty*, 53 TUL. L. REV. 609 (1979); Comment, 12 AKRON U.L. REV. 360 (1978).

⁸¹ NAACP LEGAL DEFENSE & EDUC. FUND, INC., DEATH ROW, U.S.A. 2 (Oct. 23, 1979).

⁸² Am. Sub. H.B. 74, 113th Gen. Assy. (1979-80).

tal cases by the jury and the court, to permit the sentencing authority in a capital case to consider and weigh all circumstances that mitigate against the imposition of the death penalty, to provide for a special review by courts of appeals and the supreme court of all sentences of death, to eliminate felony murder as an aggravating circumstance for aiders and abettors in murder cases, to require a person sentenced to consecutive terms of imprisonment for aggravated murder to serve fifteen or twenty-five years in prison for each sentence of life imprisonment before being eligible for parole, and to permit a defendant in certain cases to have the existence of an aggravating circumstance determined at the sentencing hearing.⁸³

In response to the objections raised by the Supreme Court in *Lockett* and *Bell* about the restricted range of possible mitigating factors to be considered in sentencing in the Ohio law, the most important aspect of Amended Substitute House Bill 74 is the allowance for the sentencing authority in a capital case to consider and weigh *all circumstances* that mitigate against the death penalty. Likewise, Amended Substitute House Bill 74 would appear to provide for the elements that Bedau identifies as the common denominator that emerged from the Court's earlier rulings in *Gregg*, *Jurek*, and *Proffitt*.⁸⁴

At this time one can only speculate as to whether a revised death penalty statute might be approved by the Ohio Senate and House. In addition, if a new death penalty law is approved for Ohio, it would be premature to speculate about the exact form the new law might take, and whether it will successfully comply with the requirements set forth by the United States Supreme Court in *Gregg*, *Jurek*, *Proffitt*, *Lockett*, and *Bell*.⁸⁵ While only time will provide answers to these questions, one thing is abundantly clear from the analysis reported in this article: if Ohio is to reinstate capital punishment, its justification will have to be based upon grounds other than the deterrent effect of the death penalty for murder. Notwithstanding the opinion of some members of the United States Supreme Court,⁸⁶ and possibly a majority of the Ohio House and Senate, the present analysis of Ohio's experience with capital punishment provides no justification for reinstating the death penalty as an effective means of dealing with the state's murder problem.

⁸³ *Id.* at introduction.

⁸⁴ See note 6 *supra*. Amended Substitute House Bill 74 was approved and passed out of the House on February 21, 1979. The bill was introduced into the Ohio Senate on February 22, 1979, and as of the time of the writing of this article, is in the hands of the Senate Judiciary Committee which is now conducting public hearings on the proposed legislation. There is presently no authoritative projection available about when, or even if, a death penalty bill will go before the full Senate for consideration.

⁸⁵ See notes 6, 77-80 *supra* and accompanying text.

⁸⁶ For a discussion of deterrence and recent rulings by the Supreme Court, see notes 3-11 *supra* and accompanying text.

APPENDIX

AN OVERVIEW OF MULTIPLE REGRESSION ANALYSIS⁸⁷

Multiple regression analysis provides a general statistical technique whereby various aspects of the relationship between a dependent variable⁸⁸ and two or more independent or predictor variables can be examined. While multiple regression analysis is a useful technique to investigate a wide variety of statistical questions, it provides the researcher with a rather straightforward means of (1) testing the independent effect of each of the predictor variables on the dependent variable, controlling for the effects of the other predictor variables of interest on the dependent variable; (2) comparing the relative effect of each of the predictor variables on the dependent variable; and (3) assessing the combined predictive power of all of the predictor variables taken together on the dependent variable.

The following types of statistics may be derived from multiple regression. First, for each of the predictor variables considered, this analysis yields unstandardized regression coefficients (commonly termed B coefficients or B values). B coefficients provide an indication of the effect of each of the predictor variables on the dependent variable, while simultaneously controlling for the effects of all of the other predictor variables on the dependent variable. To illustrate, Yunker reports a B value of -2.636 for his three-year time lag model.⁸⁹ In substantive terms, this coefficient indicates that a one-person increase in the number of executions (a predictor variable) is associated with approximately a 2.6 person reduction in the homicide rate (the dependent variable), controlling for the effects of unemployment, which is Yunker's second predictor variable. The *sign* of the B value indicates whether an increase in the predictor variable is associated with either an increase (+) or a decrease (-) in the level of the dependent variable. The *size* of the B coefficient indicates the number of units of increase or decrease in the dependent variable that results from a one unit increase in the predictor variable.

Second, because the unit of measurement typically varies for different predictor variables in a regression analysis (for example, the number of executions, percent unemployment, median income in dollars, etc.), B coefficients cannot be directly compared to determine the *relative effect* of

⁸⁷ This Appendix is not intended to provide a detailed discussion of multiple regression analysis. Rather, the concern here is with providing a brief outline of the essential features of multiple regression (in non-technical terms), *i.e.*, how it has been used in the present investigation. For those not familiar with this statistical technique, the reader is urged to review the Appendix before reading the Recent Investigations and Findings sections of this article.

For more detailed and technical discussions of multiple regression analysis, see H. BLALOCK, *supra* note 20, at 381-449; A. EDWARDS, AN INTRODUCTION TO LINEAR REGRESSION AND CORRELATION (1976); J. JOHNSON, ECONOMETRIC METHODS 8-67, 121-75 (1972); J. KMENTA, ELEMENTS OF ECONOMETRICS 197-246, 347-408 (1971); N. NOMODIRI, L. CARTER & H. BLALOCK, APPLIED MULTIVARIATE ANALYSIS AND EXPERIMENTAL DESIGNS 1-75 (1975).

⁸⁸ By convention in the statistical literature, the term "dependent variable" refers to the variable that one is trying to explain, account for, or predict. In the context of the present research, and the studies reviewed in this article, the dependent variable of interest is homicide rates.

⁸⁹ Yunker, *supra* note 2, at 61.

each predictor variable on the dependent variable. To remedy this situation, standardized regression coefficients (commonly termed beta weights or beta coefficients) can be computed for each predictor variable that permits such a comparison. For example, in a situation with two predictor variables, if the beta weight is 1.0 for variable A and 2.0 for variable B, then it can be concluded that variable B provides twice as good a predictor of the dependent variable than variable A. Similarly, in situations where more than two predictor variables are being considered, the beta coefficients can be rank ordered to determine the best predictor of the dependent variable, the second best predictor, and so on, with the smallest beta value indicating the factor that is the poorest predictor of the dependent variable.

A third statistic commonly reported in regression analyses is the multiple correlation coefficient, symbolized as R^2 . The multiple correlation provides an indication of the amount of the variation in the dependent variable that can be accounted for by the combined effects of all of the predictor variables that are being considered. The larger the R^2 value (which can range from 0.0 to 1.00), the greater the predictive power of the explanatory variables.⁹⁰

Each of the above statistics (B, beta values, R^2) are measures that can be used to describe the relationship between the predictor and dependent variables for the units (years, states, etc.) that are being directly examined in the regression analysis. In Yunker's investigation, for example, the B coefficient of -2.636 that he reports describes the relationship between executions and homicide rates for the years 1960 to 1972.⁹¹ Under certain conditions, however, additional statistical tests can be computed (t and F tests) that allow the researcher to make statistical inferences on the basis of the observed B, beta, and R^2 values to a larger population (additional years, states, etc.) that was not directly considered in the analysis. For example, if the researcher can safely assume that the years that have been examined in computing B, beta, and R^2 values are representative of other years that were not included in the analysis, then statistical inference techniques can be utilized to generalize the observed findings to the larger population.⁹² Typically, researchers make use of random sampling techniques⁹³ in selecting

⁹⁰ An R^2 value of 0.0 indicates that the predictor variables being examined are unrelated to the dependent variable. An R^2 value of 1.00 indicates that the predictor variables in combination explain the total variation (100%) in the dependent variable.

⁹¹ Yunker, *supra* note 2, at 61.

⁹² In this discussion the term population refers to the universe in which the researcher wishes to make a generalization. For example, in the research reported in this article, the author wishes to make a generalization about the relationship between execution rates (controlling for sociodemographic factors) and homicide rates during the period 1910 to 1962. In order to make an inference about this time period (the population or universe of interest), a sample of 28 years has been selected for examination in the statistical analysis.

⁹³ The underlying principle of random sampling is rather straightforward. For a variety of reasons (time limitations, expense, etc.), it is often not possible to examine a complete population in testing a hypothesis about how two variables, for example, relate in the population. It is often possible, however, to directly examine a subset of the population of interest. If this subset — a sample — is representative of the larger population, then the pattern of findings observed for the sample can be generalized to the larger population.

One way to try to achieve a representative sample of a population is to select a sample on a random basis where each unit (state, year, etc.) in the population has an equal chance of being included/excluded in the sample to be studied. A wide variety of random sampling techniques is available to the researcher, but they all have one important feature in common. Since each unit in the population has an equal probability of being included in the sample, there is no *a priori* reason

the units to observe (for example, a sample of years to examine from a more extended time period) in attempting to meet the assumption that the units that have been examined are representative of a larger population. Here the concern is with the possible effect of sampling error and with the effect the examination of a set of atypical observations may have in reaching a biased generalization about a hypothesized relationship in the population.

Generally, in a multiple regression analysis the null hypothesis is advanced that there is no relationship between the predictor variable of primary interest and the dependent variable, controlling for the effect of the other predictor variable(s) on the dependent variable, and all of the predictor variables and the dependent variable. In the context of the present research, the null hypothesis is in contrast to the research hypotheses that executions have a significant negative effect on homicide rates, controlling for the effect of other factors on homicides, and homicide rates are significantly related to the combined effects of all of the predictor variables. In the former case, the concern is with the significance of the partial regression coefficient for the execution variable (B and β values). In the latter case, the concern is with the significance of the multiple correlation coefficient (R^2) when all of the predictor variables are considered.

If it can be assumed that the units being examined (the sample) are representative of the units to which the researcher wishes to make an inference (the population), then statistical tests are available to test the validity of the null hypothesis and, accordingly, the validity of the research hypothesis. The t and F tests are two such tests that can be used in regression analyses in order to make a population inference on the basis of examining sample data.⁹⁴ With both t and F tests the explicit concern is with making a probability statement (with as small a degree of error as possible) that the findings (B , β , R^2 values) observed for the sample are representative of the relationship between the predictor and dependent variables in the population.

Short of considering complete population data, sampling may result in the to believe that the units that are selected for the sample are unlike the units in the overall population. That is, if the sample does differ from the population, it will differ only by chance, and, as pointed out in a later section of the Appendix to this article, the effect of such chance variation will steadily decrease as the proportion of the population included in the sample increases.

⁹⁴ The t and F tests are statistical techniques that can be used to determine the validity of the null hypothesis (that there is no relationship between the predictor and dependent variables for the population) and, accordingly, the validity of the research hypothesis (that the hypothesized relationship between the predictor and dependent variables does hold for the population). Both t and F tests are based upon the size of the sample that is being considered and the size of the B , β , and R^2 values observed for the sample.

If the null hypothesis is correct for the population, then the observed B , β , and R^2 values for the sample should be zero, *i.e.*, there is no association between the variables in question. However, even if the null hypothesis is correct (and the research hypothesis is incorrect), the B , β , and R^2 values for the sample may not be zero due to sampling error, *i.e.*, due to unrepresentative units being included in the sample. The probability of such an occurrence decreases, however, as the proportion of the population included in the sample increases.

The t and F tests are statistical techniques designed to determine the probable effect of sampling error on B , β , and R^2 values observed for a sample. In general terms, the larger the observed B , β , and R^2 values, the larger the corresponding t and F values, and the larger the t and F values, the greater the probability that the null hypothesis is correct that the predictor and dependent variables are related for the population. For a more detailed and technical discussion of t and F tests, see H. BLALOCK, *supra* note 87, at 493-97; A. EDWARDS, *supra* note 87, at 103-13; J. KMENTA, *supra* note 87, at 112-53; N. NOMODIRI, L. CARTER & H. BLALOCK, *supra* note 87, at 167-79.

selection of unrepresentative observations. (When complete population data are being examined, there is no possibility of sampling error since the total population of interest is being considered in the analysis. Accordingly, B , β , and R^2 values describe the relationship between the predictor and dependent variables for the population.) As a general rule, however, the researcher has a greater degree of confidence that the relationships observed for the sample will reflect the relationships of concern in the population if a proper procedure has been followed in selecting a sample of observations to consider and a sufficiently large number of observations have been included in the sample. As noted above, random sampling procedures are typically utilized in order to achieve a representative sample of the population of interest.⁹⁵ In addition, the larger the proportion of the population that is included in the sample, the greater the confidence that the sample data will yield an accurate reflection of the population.

Based upon these two considerations, t and F tests permit a population inference to be made on the basis of sample data when multiple regression is used.⁹⁶ Either t or F tests can be used in assessing the statistical significance of B and β coefficients, and the F test is used to assess the statistical significance of R^2 values. These statistical inference tests allow the researcher to make a probability statement, with a specified degree of error, that values of B , β , and R^2 are as large, or larger, for the population as the values for these statistics observed for the sample. The larger the size of the t and F values, the greater the confidence (probability) that the null hypothesis is incorrect (*e.g.*, $B > 0$, $\beta > 0$, $R^2 > 0$), and the greater the probability that the research hypothesis is correct. It is important to emphasize that t and F tests only permit a *probability statement* to be made about the relationship between the variables of interest in the population. As noted above,⁹⁷ whenever less than complete population data (a sample) are being examined, there is always the possibility that a certain degree of sampling error will result.

By convention in the social sciences, researchers have adopted the rule-of-thumb of not considering as statistically significant any B , β , or R^2 value unless its corresponding t or F value reaches at least what is termed the .05 level of statistical significance. The .05 level simply means that there is only a five percent chance (probability) that a B value, for example, is actually zero in the population (that the null hypothesis is correct), but due to sampling error the observed B value for the sample is greater than zero. Conversely, the .05 level of significance indicates that there is a 95 percent chance (probability) that the B value is *not* zero in the population and that the population B value is as large, or larger, than that observed for the sample.

The larger the t and F values associated with the B , β , and R^2 coefficients derived from the sample data, the greater the probability that the same pattern of B , β , and R^2 values also hold for the population. For example, for B values that have a t or F statistic that is statistically significant at the .01 level, there is only a one percent chance that the null hypothesis is

⁹⁵ See note 93 *supra*.

⁹⁶ See note 94 *supra*.

⁹⁷ *Id.*

correct ($B = 0.0$) and a 99 percent chance that the B value for the population is as large, or larger, than that observed for the sample. Similarly, for B values that have a t or F statistic that is significant at the .001 level, there is only a one-tenth of one percent chance that the null hypothesis is correct ($B = 0.0$) and a 99.9 percent chance that the B value for the population is as large, or larger, than that observed for the sample. The same logic and interpretation also applies in assessing the statistical significance of beta and R^2 values.

For the analysis reported in Tables 1-6 in this article, the .05, .01, and .001 levels of statistical significance are utilized in describing the results of the regression analysis for the B , beta, and R^2 coefficients, respectively. The significance level of the coefficients is indicated by a letter code that appears with the F values for each variable in the tables; letters "a," "b," and "c" signify statistical significance at the .05, .01, and .001 levels, respectively. An F value not accompanied by a letter code indicates that the predictor variable in question is not significantly related to the dependent variable at at least the .05 level. Such predictor variables are not considered as significantly related to homicide rates in this analysis.

TABLE 1

RELATIONSHIP BETWEEN OHIO EXECUTION RATES,
SELECTED SOCIODEMOGRAPHIC VARIABLES
AND HOMICIDE RATES

Homicide Rate Results

Ind. Variable	B Coeff.	Beta Coeff.	F Value
Pro. Male Pop.	475.4065	2.0493	13.914b
Pro. Age 20-40 yrs.	-29.1424	-1.1005	29.032c
Pro. Nonwhite Pop.	-97.3880	-.9368	1.554
Pct. Unemployed	-.5370	-.4738	17.939c
Pro. Urban Pop.	46.8356	1.1687	12.901b
Execution Rate	-.0450	-.0227	.070

Constant = -245.3883

R² = .904

F = 32.837c

Mean Homicide Rate Results

Pro. Male Pop.	498.0242	2.2146	36.600c
Pro. Age 20-40 yrs.	-30.2000	-1.1765	74.730c
Pro. Nonwhite Pop.	-77.4306	-.7684	2.355
Pct. Unemployed	-.5189	-.4723	40.152c
Pro. Urban Pop.	40.6956	1.0476	23.347c
Execution Rate	-.0367	-.0191	0.111

Constant = -253.4376

R² = .957

F = 78.345c

a = P < .05; b = P < .01; c = P < .001

TABLE 2

RELATIONSHIP BETWEEN OHIO EXECUTION RATES,
SELECTED SOCIODEMOGRAPHIC VARIABLES AND
HOMICIDE RATES, WITH A ONE-YEAR TIME LAG
BETWEEN EXECUTION AND HOMICIDE RATES

Homicide Rate Results

Ind. Variable	B Coeff.	Beta Coeff.	F Value
Pro. Male Pop.	475.1206	2.0481	13.623c
Pro. Age 20-40 yrs.	-29.3230	-1.1073	30.224c
Pro. Nonwhite Pop.	-98.0746	-.9434	1.495
Pct. Unemployed	-.5384	-.4751	17.989c
Pro. Urban Pop.	46.8762	1.1697	12.616b
Execution Rate	-.0452	-.0222	.067

Constant = -245.1680

R² = .904

F = 32.831c

Mean Homicide Rate Results

Pro. Male Pop.	505.5902	2.2483	36.821c
Pro. Age 20-40 yrs.	-30.3787	-1.1834	77.426c
Pro. Nonwhite Pop.	-72.3417	-.7178	1.942
Pct. Unemployed	-.5184	-.4719	39.609c
Pro. Urban Pop.	39.9068	1.0273	21.924c
Execution Rate	-.0156	-.0079	.019

Constant = -256.9396

R² = .957

F = 77.896c

a = P < .05; b = P < .01; c = P < .001

TABLE 3
RELATIONSHIP BETWEEN OHIO RESIDUAL EXECUTION RATES,
SELECTED SOCIODEMOGRAPHIC VARIABLES
AND HOMICIDE RATES

<i>Homicide Rate Results</i>			
Ind. Variable	B Coeff.	Beta Coeff.	F Value
Pro. Male Pop.	474.2687	2.0444	17.858c
Pro. Age 20-40 yrs.	-28.9157	-1.0919	29.899c
Pro. Nonwhite Pop.	-95.9210	-.9227	2.134
Pct. Unemployed	-.5485	-.4839	18.957c
Pro. Urban Pop.	47.1323	1.1761	16.922c
Execution Rate	-.3012	-.0583	.649
Constant = -245.1374			
R ² = .906			
F = 33.835c			
<i>Mean Homicide Rate Results</i>			
Pro. Male Pop.	506.7280	2.2533	47.540c
Pro. Age 20-40 yrs.	-30.2776	-1.1795	76.445c
Pro. Nonwhite Pop.	-70.7926	-.7025	2.710
Pct. Unemployed	-.5208	-.4740	39.859c
Pro. Urban Pop.	39.8305	1.0253	28.182c
Execution Rate	-.0788	-.0158	.104
Constant = -257.5739			
R ² = .957			
F = 78.315c			

a = P < .05; b = P < .01; c = P < .001

TABLE 4

RELATIONSHIP BETWEEN OHIO EXECUTION RATES,
SELECTED SOCIODEMOGRAPHIC VARIABLES
AND LOG HOMICIDE RATES

Homicide Rate Results

Ind. Variable	B Coeff.	Beta Coeff.	F Value
Pro. Male Pop.	52.6725	1.2675	6.285a
Pro. Age 20-40 yrs.	-4.3930	-.9261	24.273c
Pro. Nonwhite Pop.	-33.7920	-1.8146	6.884a
Pct. Unemployed	-.0920	-.4530	19.356c
Pro. Urban Pop.	10.0855	1.4049	22.011c
Execution Rate	-.0042	-.0118	.022

Constant = -27.6037

R² = .918

F = 39.402c

Mean Homicide Rate Results

Pro. Male Pop.	57.3132	1.4039	16.673c
Pro. Age 20-40 yrs.	-4.5885	-.9846	59.337c
Pro. Nonwhite Pop.	-29.8678	-1.6326	12.051b
Pct. Unemployed	-.0888	-.4454	40.474c
Pro. Urban Pop.	8.8408	1.2536	37.899c
Execution Rate	-.0036	-.0104	.037

Constant = -29.2556

R² = .962

F = 89.277c

a = P < .05; b = P < .01; c = P < .001

TABLE 5

RELATIONSHIP BETWEEN OHIO EXECUTION RATES,
SELECTED SOCIODEMOGRAPHIC VARIABLES
AND HOMICIDE RATES, WITH A ONE-YEAR TIME LAG
BETWEEN EXECUTION AND LOG HOMICIDE RATES

Homicide Rate Results

Ind. Variable	B Coeff.	Beta Coeff.	F Value
Pro. Male Pop.	52.7885	1.2703	6.187a
Pro. Age 20-40 yrs.	-4.4104	-.9297	25.156c
Pro. Nonwhite Pop.	-33.7525	-1.8125	6.516a
Pct. Unemployed	-.0921	-.4535	19.252c
Pro. Urban Pop.	10.0742	1.4034	21.439c
Execution Rate	-.0038	-.0105	.017
Constant = -27.6505			
R ² = .918			
F = 39.392c			

Mean Homicide Rate Results

Pro. Male Pop.	57.8433	1.4169	16.630c
Pro. Age 20-40 yrs.	-4.6052	-.9882	61.397c
Pro. Nonwhite Pop.	-29.5224	-1.6137	11.159b
Pct. Unemployed	-.0888	-.4454	40.127c
Pro. Urban Pop.	8.7857	1.2458	36.501c
Execution Rate	-.0021	-.0059	.012
Constant = -29.4990			
R ² = .962			
F = 89.166c			

a = P < .05; b = P < .01; c = P < .001

TABLE 6

RELATIONSHIP BETWEEN OHIO RESIDUAL EXECUTION RATES,
SELECTED SOCIODEMOGRAPHIC VARIABLES
AND LOG HOMICIDE RATES

Homicide Rate Results

Ind. Variable	B Coeff.	Beta Coeff.	F Value
Pro. Male Pop.	51.6973	1.2440	7.766a
Pro. Age 20-40 yrs.	-4.3482	-.9166	24.745c
Pro. Nonwhite Pop.	-34.1466	-1.8336	9.896b
Pct. Unemployed	-.0937	-.4615	20.251c
Pro. Urban Pop.	10.2130	1.4227	29.081c
Execution Rate	-.0431	-.0466	.486

Constant = -27.1886

R² = .920

F = 40.348c

Mean Homicide Rate Results

Pro. Male Pop.	58.2698	1.4273	21.614c
Pro. Age 20-40 yrs.	-4.5988	-.9868	60.636c
Pro. Nonwhite Pop.	-29.1576	-1.5938	15.807c
Pct. Unemployed	-.0889	-.4459	39.972c
Pro. Urban Pop.	8.7441	1.2399	46.700c
Execution Rate	-.0061	-.0067	.021

Constant = -29.7078

R² = .962

F = 89.206c

a = P < .05; b = P < .01; c = P < .001

