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# CONSIDERING LEAD POISONING AS A CRIMINAL DEFENSE

Deborah W. Denno\*

## I. Introduction

No doubt, Frank X<sup>1</sup> stood apart from his peers. At age twenty-three, he already had an extensive criminal record: twenty-seven officially recorded offenses as a juvenile and ten offenses as an adult. His first recorded offense was for truancy at age ten. From ages twelve to twenty-two, he had at least two and as many as six recorded offenses every year. These offenses included robbery, assault, theft, and repeated disorderly conduct.

Frank was a subject in the "Biosocial Study," one of this country's largest "longitudinal" studies of biological, sociological, and environmental predictors of crime.<sup>2</sup> A longitudinal study analyzes the same group of individuals over a period of time.<sup>3</sup> The Biosocial Study is unique because it analyzed numerous variables relating to a group of nearly one thousand males and females during the first twenty-four years of their lives: from the time the subjects' mothers were admitted into the same Philadelphia hospital to give birth until the subjects' twenty-fourth birthday.

A significant factor in the Biosocial Study was that all subjects resided in Philadelphia, and all shared the same urban environment and school system.<sup>4</sup> Detailed information was collected during the course of these subjects' lives in order to answer two basic questions: First,

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1. This pseudonym was created to protect the subject's identity.

2. The Biosocial Study is described in detail in two sources: DEBORAH W. DENNO, *BIOLOGY AND VIOLENCE: FROM BIRTH TO ADULTHOOD* (1990) [hereinafter DENNO, *BIOLOGY AND VIOLENCE*]; Deborah W. Denno, *Human Biology and Criminal Responsibility: Free Will or Free Ride?*, 137 U. PA. L. REV. 615 (1988).

3. See JOHN M. NEALE & ROBERT M. LIEBERT, *SCIENCE AND BEHAVIOR: AN INTRODUCTION TO METHODS OF RESEARCH* 109 (3d ed. 1986); JULIAN L. SIMON & PAUL BURSTEIN, *BASIC RESEARCH METHODS IN SOCIAL SCIENCE* 90 (3d ed. 1985).

4. See *infra* notes 9, 21-22 and accompanying text.

what factors within, or in addition to, these subjects' urban environments were related to any criminal behavior they may engage in? Second, what factors were associated with fairly well-established indicators of crime, such as academic and disciplinary problems in school?

The multidisciplinary nature of the Biosocial Study's data enabled the testing of many different theories of crime: biological, psychological, social, and environmental.<sup>5</sup> Given this broad range, however, one of the Biosocial Study's major findings was particularly striking: Among males, lead poisoning, a factor related to the urban environment, was among the strongest predictors of crime, even though numerous biological and psychological factors were also examined.

This Essay first describes the Biosocial Study and its results, and then considers whether it is viable to establish a lead poisoning criminal defense in light of the Study's finding of a significant relationship between lead poisoning and its three variables indicating behavioral problems at different ages: adult crime, juvenile crime, and disciplinary problems in school. It is suggested that it is philosophically inconsistent to provide for criminal defenses based upon what appear to be "internal" factors, such as brain tumors, but then discount defenses based on what appear to be "external" factors, such as lead poisoning or other types of environmental factors, given the fragile assumptions of causation that this "internal-external" distinction is based on. This Essay concludes that because the criminal law does provide for some defenses, urban criminal justice appears to be fair. The considerable disparity between the types of defenses found acceptable in the criminal law, however, makes urban criminal justice unfair. In light of this unfairness, this Essay suggests that the criminal law be more flexible in considering both internal and external factors in determining an individual's eligibility for a criminal defense. However, this Essay also suggests that a number of presently accepted (or proposed) criminal law defenses should be restricted or eliminated altogether. These defenses either lack a firm causal foundation, or they appear to be more arbitrarily applied.

## II. The Biosocial Study

### A. Subjects and Measures

The 987 subjects who participated in the Biosocial Study were born at Philadelphia's Pennsylvania Hospital between 1959 and 1962. The subjects and their families were originally part of the Collaborative

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5. See *infra* notes 15-28 and accompanying text.

Perinatal Project, one of the largest medical projects ever conducted in this country.<sup>6</sup> All subjects were black because a sample of white subjects was too limited in size to be included in analyses of crime.<sup>7</sup> For the purposes of this Essay, only males were examined because their crimes were more serious than the crimes reported for females.<sup>8</sup>

The final sample of 487 males was selected according to certain criteria to ensure that all attended Philadelphia public schools and

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6. In 1957, the National Institute of Neurological Diseases and Stroke launched the Collaborative Perinatal Project, a nationwide study of biological and environmental influences on pregnancy, infant and childhood mortality, as well as physical, neurological, and psychological development in children. Nearly 60,000 pregnant women participated in the study between 1959 and 1966 in 15 different medical centers. One of these medical centers was located in Philadelphia. Examination of the children from the time of their birth through age seven continued until 1974. See KENNETH NISWANDER & MYRON GORDON, *THE WOMEN AND THEIR PREGNANCIES* 3-7 (1972).

The Philadelphia Perinatal Project comprised the nearly 10,000 pregnant patients who delivered their children at Pennsylvania Hospital between 1959 and 1965; the children were later tested at Children's Hospital of the University of Pennsylvania. *Id.* at 11. All pregnant women who attended Pennsylvania Hospital during this time were included in the Philadelphia Perinatal Project if they wanted to be, except for those women who were unregistered emergency deliveries or who were planning to deliver elsewhere. The total sample in the Philadelphia Perinatal Project reflects, in part, the characteristics of families who would be interested in receiving inexpensive maternity care provided by a public clinic. The sample was comprised predominantly (87%) of black families whose socioeconomic levels were slightly lower than those of the United States population at the time. *Id.* at 10, 475, 498. In 1978, the Sellin Center for Studies in Criminology and Criminal Law at the University of Pennsylvania was awarded a grant by the National Institute of Justice to examine the Philadelphia Perinatal Project children. As part of the grant, public school and police record data were collected on all 10,000 youths. For eight years thereafter, detailed data were organized and analyzed on a subsample consisting of the nearly 1,000 individuals who constituted the subjects for the Biosocial Study. These 1,000 subjects were selected from the first four years (1959-62) or from "cohorts" of 2,958 black mothers who participated in the Philadelphia Perinatal Project. A "cohort" is "[a]ny group that passes through a set of experiences or institutions at the same time." NEALE & LIEBERT, *supra* note 3, at 309.

7. The racial and socioeconomic characteristics of this sample (black and lower-class) limit the extent to which the results of the Biosocial Study can be generalized to other groups that may comprise individuals of a different race and socioeconomic status, such as middle-class whites. However, the demographic homogeneity of the Biosocial Study's sample provides built-in "controls" for those racial and socioeconomic factors that have been strongly linked to crime and its determinants. See generally MARVIN E. WOLFGANG ET AL., *DELINQUENCY IN A BIRTH COHORT* (1972). Therefore, it can be assumed that the results of the Biosocial Study are not attributed to racial and socioeconomic variations among individuals.

8. Although 22% of the 987 youths experienced at least one offense prior to age 18, strong gender differences appeared. Over twice as many males (31%) than females (14%) had any offenses. Among those males and females who did have an offense, twice as many males (25%) had at least one offense that involved violence or injury to at least one other person, in comparison to females (12%). See DENNO, *BIOLOGY AND VIOLENCE*, *supra* note 2, at 40-41. Moreover, 22% of the sample of male offenders were arrested as adults compared to only 5% of the female offenders. *Id.* at 46.

remained in the city, and thus the same urban environment, from the time of their birth up to age twenty-four.<sup>9</sup> In order to test different theories of crime, the Biosocial Study used, in addition to urban environment, three primary data sources: (1) the Perinatal Project's data set of early biological and environmental factors; (2) public school records; and (3) official police records for juveniles and adults.

The amount of data available for *early biological and environmental factors* was extraordinarily comprehensive. Upon registration for the Perinatal Project, each mother underwent a battery of interviews and physical examinations that provided data for each pregnancy, including the mother's reproductive history, recent and past medical history, and labor and delivery events. Data recorded for each child included information on neurological examinations conducted at birth, throughout the hospital stay, at four months, and at ages one and seven. Additionally, the children took speech, language, and hearing examinations at ages three and eight. Researchers collected socioeconomic and family data during the mother's registration and the child's seven-year examination.<sup>10</sup>

Philadelphia *public school records* also contained a variety of additional data about each subject, although the Biosocial Study relied predominately on two types: (1) academic achievement during ages thirteen and fourteen<sup>11</sup> and (2) evidence of learning or disciplinary

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9. These subjects were selected according to the following criteria: (1) attended a Philadelphia public school, (2) stayed in Philadelphia from ages 10 through 17, (3) received selected intelligence tests within six months of age seven and achievement tests at ages 13 and 14, and (4) did not have a sibling in the sample to prevent the possible biases that could result in examining family members. Comparisons between the final sample of 987 subjects and the excluded sample of 2,158 black subjects showed no significant differences in key variables: total family income, per capita family income, the number of prenatal examinations attended by the mother, the mother's age, and the distribution of males and females. In general, the final sample appeared to be representative of the sample from which it was drawn. *Id.* at 30.

10. Data were collected immediately after an event occurred. Highly structured forms and manuals were used to ensure comprehensiveness and comparability among the coders who recorded the data. All coders were either medical doctors or psychologists trained to record data systematically. For descriptions of the numerous procedures used to ensure reliability in the Project's coding, see NISWANDER & GORDON, *supra* note 6, at 17-19, 500-24.

11. The California Achievement Test measured academic achievement in grades seven and eight, which were attended during ages 13 and 14. Social scientists have described the California Achievement Test as an excellent data source for measuring both verbal and mathematical achievement. See DENNO, *BIOLOGY AND VIOLENCE*, *supra* note 2, at 171-73. Researchers have found a high correlation between that test and the other tests measuring achievement that were administered in the Perinatal Project at age seven. *Id.* at 169. Moreover, the standardization sample for the California Achievement Test allowed for "proportionate representation in the national norms of minority group students in the total school population." *Id.* at 171 (citation omitted). However, social

problems in school.<sup>12</sup>

In addition, the Biosocial Study collected *official police records* for all subjects from ages seven to twenty-four. The Study used three different measures of juvenile and adult crime: (1) number of offenses; (2) categorization of juvenile offenders according to levels of the most serious offense recorded (violence, property, and nonindex),<sup>13</sup> and (3) seriousness of offenses.<sup>14</sup>

## B. Biological and Environmental Influences on Crime

### 1. The Urban Environment

During the 1960s, at the time of the Perinatal Project, the majority of large metropolitan areas, including Philadelphia, experienced significant social upheaval and shifts in the distribution of nonwhite residential patterns.<sup>15</sup> In general, throughout the decade, there was an

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scientists have found evidence of test bias in a number of other psychological tests administered in the Perinatal Project based upon a wide range of possible racial, socioeconomic, and cultural influences. *Id.* at 173. Because the individuals in the Biosocial Study were racially and socioeconomically homogenous, many of the factors most influential in creating test bias did not exist in the Study's analyses.

12. Learning and disciplinary problems during school were measured, respectively, by the presence of any record of the child's involvement in special school programs for those classified as being mentally retarded or as having disciplinary problems. Children with disciplinary problems were diagnosed as having normal intelligence but some record of asocial behavior in school, including a history of starting fires, physical aggression toward teachers, maladjustment to school, and conduct disturbance. The Philadelphia School Board stated that any school's recommendation of a child to a special school program was made independently of any knowledge of that child's official delinquency status. *See id.* at 32, 62-63.

13. DENNO, BIOLOGY AND VIOLENCE, *supra* note 2, at 32. There were three types of offenders in the Biosocial Study: violent, property, and nonindex. Violent offenders were those individuals who had a record of at least one violent offense at any time during their juvenile criminal career. Violent offenses consisted of murder, assault with intent to kill, aggravated assault, simple assault, rape, robbery with injury, and any other offense that involved injury to the victim. Property offenders had a record of at least one property-related offense, but no history of violent offenses. Property-related offenses included vandalism, burglary, robbery without injury, and auto theft. Nonindex offenders had a record of at least one nonindex offense, but no history of violent or property-related offenses. Nonindex offenses comprised truancy, disorderly conduct, running away, fraud, and possession of alcohol, marijuana, or hard drugs. *Id.* at 39.

14. The method of ranking and scoring offense seriousness was based on a widely accepted and validated system of assigning numerical weights to different components of an offense that was derived from a national survey of crime severity. *See generally* MARVIN E. WOLFGANG ET AL., THE NATIONAL SURVEY OF CRIME SEVERITY (1985). The different components of an offense included the seriousness of personal injury to the victim, the amount of property theft or damage, the extent to which the victim was intimidated (for example, through a threat of gross bodily harm), the number of premises that the offender entered, and the number of vehicles stolen. *Id.* at 129-36.

15. *See* ROGER LANE, WILLIAM DORSEY'S PHILADELPHIA & OURS: ON THE PAST AND FUTURE OF THE BLACK CITY IN AMERICA 366 (1991); Frederick B. Glantz &

increase in the concentration of blacks and all nonwhites in urban areas.<sup>16</sup> In Philadelphia, for example, the proportion of blacks rose from 23% in 1960 to 33% in 1970.<sup>17</sup> With the exception of New York City, Philadelphia was probably the most socially heterogeneous city in the United States.<sup>18</sup> Despite such diversity, however, ethnic and racial groups had a long tradition of residential segregation.<sup>19</sup> Even neighborhoods that appeared ethnically mixed in tabulated statistics remained firmly segregated at the block level.<sup>20</sup>

During the time when the Biosocial Study's subjects were young children, most blacks with low incomes were concentrated in Philadelphia's inner city areas, which were isolated socially and culturally.<sup>21</sup> Plagued by overcrowded and substandard housing, the social-cultural constraints and conditions of these neighborhoods were recognized as "festers of crime."<sup>22</sup>

Evidence that crime is associated with community and urban factors was first investigated on a large scale by Clifford Shaw and Henry McKay<sup>23</sup> in Chicago and other metropolitan areas. A substantial amount of research since that time has confirmed their conclusion that high rates of crime are concentrated in areas where residents are deprived socioeconomically.<sup>24</sup> Other researchers contend, however, that social instability, and not socioeconomic deprivation, accounts for the association between community characteristics and crime.<sup>25</sup>

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Nancy J. Delaney, *Changes in Nonwhite Residential Patterns in Large Metropolitan Areas, 1960 and 1970*, NEW ENG. ECON. REV., Mar.-Apr. 1973, at 2-13 [hereinafter Glantz & Delaney].

16. See Glantz & Delaney, *supra* note 15, at 2-13.

17. PETER O. MULLER ET AL., METROPOLITAN PHILADELPHIA: A STUDY OF CONFLICTS AND SOCIAL CLEAVAGES 14 (1976).

18. *Id.* at 1.

19. *Id.* at 18-23.

20. *Id.* at 22-23.

21. See CONRAD WEILER, PHILADELPHIA: NEIGHBORHOOD, AUTHORITY, AND THE URBAN CRISIS 181-82 (1974); John F. Bauman et al., *Public Housing, Isolation, and the Urban Underclass*, 17 J. URB. HIST. 264, 265, 273-86 (1991).

22. Gaeton Fonzi, *Hard-core Families A Festering Empire*, 51 GREATER PHILA. MAG. 17, 18, 50-55 (1960); see also JOHN F. BAUMAN, PUBLIC HOUSING, RACE, AND RENEWAL: URBAN PLANNING IN PHILADELPHIA, 1920-1974, 183-201 (1987).

23. See generally CLIFFORD R. SHAW & HENRY D. MCKAY, JUVENILE DELINQUENCY AND URBAN AREAS (1972).

24. See, e.g., NATIONAL RESEARCH COUNCIL, UNDERSTANDING AND PREVENTING VIOLENCE 131-39 (Albert J. Reiss, Jr. and Jeffrey A. Roth eds., 1993) (emphasizing the link between low socioeconomic status and crime); E. Britt Patterson, *Poverty, Income Inequality, and Community Crime Rates*, 29 CRIMINOLOGY 755-64 (1991) (reviewing recent research on poverty and crime); see also Nicholas Lemann, *Four Generations in the Projects*, N.Y. TIMES, Jan. 13, 1991 (magazine), at 17 (examining four generations of a family living in a Chicago public housing project).

25. Patterson, *supra* note 24, at 762-63 (noting that although a considerable research

Regardless of conflicting perspectives on the importance of socioeconomic disadvantage, studies converge in their conclusions that the structures in a community strongly influence the criminal behavior of youths.<sup>26</sup>

## 2. *Socioeconomic and Environmental Factors*

Although the Biosocial Study "controlled" or accounted for the effects of the urban environment because all subjects were raised in it, the Study examined many other kinds of socioeconomic and environmental data. These data included, among other factors: parents' occupation, education, and employment history; family income and size; religion; marital stability; welfare status; whether or not the child resided in a foster home; and number of persons supported in the household. As would be expected, many of these factors were interrelated.<sup>27</sup>

## 3. *Biological and Psychological Factors*

The first stage of the Biosocial Project examined nearly 150 factors that were selected according to developmental and biopsychological theories of crime. These factors included the following: early central nervous system development; intelligence and laterality; physical growth and development; neurological status; attention deficit disorder and hyperactivity; and general physical health.<sup>28</sup>

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demonstrates a link between poverty and crime, other research has uncovered additional factors indicating a link between crime and factors associated with social instability, including: residential mobility, family disorganization, and population density); *see also* Richard Block, *Community, Environment, and Violent Crime*, 17 *CRIMINOLOGY* 46 (1979).

26. NATIONAL RESEARCH COUNCIL, *supra* note 24, at 138-39; Patterson, *supra* note 24, at 763.

27. For a description of how these variables were measured and interrelated, as well as extensive literature describing their association with crime, see DENNO, *BIOLOGY AND VIOLENCE*, *supra* note 2, at 19-24.

28. *See id.* at 34-36. Developmental and biopsychological theories of crime emphasize the physiological and psychological capacities for individuals to adjust to their environments, and to learn appropriate behavior. Individuals who show central nervous system disorders, delayed maturation, or low intelligence test scores, for example, may be more vulnerable to negative or stressful environments. *Id.* at 24-28. These relationships exist regardless of the racial or socioeconomic characteristics of those individuals, although individuals who are minorities and are from lower socioeconomic backgrounds are more likely to be raised in stressful environments. *Id.* at 19. In the Biosocial Study, indicators of developmental or psychological theories were grouped very generally into six types: (1) early central nervous system development (e.g., prenatal and pregnancy complications and Apgar score, an accepted and validated scale of health and development immediately following birth); (2) intelligence and cerebral dominance (e.g., measures of verbal and spatial ability, as well as indicators of laterality, such as the child's



### C. What the Biosocial Study Found

The integration of both biological and environmental factors is a crucial step toward understanding why crime occurs and how it relates to criminal responsibility. Based upon extensive research in this area, a juvenile or adult criminal status may depend, in part, on early developmental, biological, and environmental factors whose cumulative influences vary over time. Associations among the biological and environmental factors selected for the Biosocial Study were examined over time to determine which factors predicted crime, and how these factors were interrelated. Major results are reported in Table I of this Essay, which lists the statistically significant predictors<sup>29</sup> for the Study's three variables indicating behavioral problems at different ages: (1) adult crime; (2) juvenile crime; and (3) disciplinary problems in school.

#### 1. Significant Predictors

In explaining Table I's results, it is important to note that the interrelationships among the different measures in the Biosocial Study were all examined using a statistical model that accounted for the different effects these measures had on one another, independent from any effect these measures would have on juvenile or adult crime, or disciplinary problems in school.<sup>30</sup> Thus, a strong relationship be-

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hand, eye, and foot preference, which are indicative of learning disabilities); (3) physical growth and development (e.g., measures of height and weight); (4) neurological status (e.g., "soft neurological signs" or lack of coordination); (5) attention deficit disorder and hyperactivity (e.g., evidence of disciplinary problems in childhood and adolescence, as well as mixed indicators of laterality and difficulty with left-right identification); and (6) general physical health (e.g., high blood pressure, pica, lead poisoning, and anemia). *Id.* at 37-39.

29. For a definition of statistical significance, see *infra* note 112.

30. Interrelationships among these measures were examined using structural equation path models which have been found to be useful in many areas of the social and behavioral sciences. The path models, which combine features of factor analysis and regression analysis, are especially appropriate for analyzing longitudinal panel data because each equation represents a "causal link," in contrast to ordinary least squares regression analysis, in which each equation represents an empirical association. See generally William W. Cooley, *Introduction: Structural Equations and Explanatory Observational Studies*, in *ADVANCES IN FACTOR ANALYSIS AND STRUCTURAL EQUATION MODELS* xv (Jay Magidson ed., 1979). Karl Joreskog's development of a general linear model for the analysis of covariance structures, which was applied in analyzing the Biosocial Study data, provides for a system of equations relating unobservable and observable independent and dependent variables with an underlying causal structure. See Karl G. Joreskog, *Structural Equation Models in the Social Sciences: Specification, Estimation and Testing*, in *ADVANCES IN FACTOR ANALYSIS AND STRUCTURAL EQUATION MODELS* 105-07 (Jay Magidson ed., 1979).

tween any particular variable and crime "controlled" or accounted for any other effects that may be influencing that one variable.

As would be expected from the results of the Biosocial Study, the number and seriousness of juvenile offenses was the strongest predictor of the subjects' crimes as adults. In addition, their adult crime was next most strongly influenced by both their mother's and their father's low educational levels, evidence of their high levels of lead poisoning at their age seven examination, and the number of gaps in their father's employment history.

In turn, juvenile crime was most strongly predicted by the number of the subjects' disciplinary problems in school, evidence of lead poisoning, the amount of time their fathers were unemployed and, to a lesser degree, evidence of abnormal speech and low language achievement. In turn, disciplinary problems among these children were most strongly predicted by lead poisoning, anemia, and left-handedness. Less strongly related to disciplinary problems were foster home status and frequent household moves.

Although these results were consistent with past findings emphasizing the significance of behavior and ability in predicting crime,<sup>31</sup> the Biosocial Study also revealed the importance of a number of factors that had never before been examined in crime research, particularly those related to the urban environment. Even in a racially and environmentally homogeneous sample of children, environmental factors predominated in predicting who would be a criminal.

The most significant environmental variable, however, was lead poisoning (highlighted in Table I) — the only factor that showed an independent effect on each of the three "problem behavior" variables. As the next section of this Essay discusses, although lead poisoning is oftentimes "biological-looking" because it can lead to permanent physical disorders, such as neurodevelopmental delay and intellectual deficit, its origins are environmental.<sup>32</sup>

In the Biosocial Study, crime also appeared to be related to a lack of behavioral control typically associated with poor environment as well as neurological and central nervous system disorders. Studies have shown links among behavioral disorders, low school achievement, and subsequent crime in intellectually normal children with attention deficit disorder and hyperactivity.<sup>33</sup> Comparable links have

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31. See generally Jennifer L. White et al., *How Early Can We Tell?: Predictors of Childhood Conduct Disorder and Adolescent Delinquency*, 28 *CRIMINOLOGY* 507 (1990).

32. See *infra* notes 44-82 and accompanying text.

33. See DENNO, *BIOLOGY AND VIOLENCE*, *supra* note 2, at 24-27.

also been found with lead poisoning.<sup>34</sup>

The Biosocial Study revealed that attention deficit disorder and hyperactivity may be linked to learning and behavioral disorders that could lead to academic problems among school children. Academic failure in turn can perpetuate criminal behavior and hinder a child's attempts at future, socially acceptable behavior even through adulthood.<sup>35</sup>

However, results of the Biosocial Study were not consistent with some past findings showing associations among crime and low early intelligence, mental retardation, or early central nervous system dysfunction (indicated by the number of a mother's pregnancy complications).<sup>36</sup> The lack of any strong association among these variables and crime may be due to a number of factors, most likely the strong cultural and demographic homogeneity of the sample and the simultaneous examination of both biological and environmental variables. Traditional studies of crime have typically examined either biological or environmental variables, not both together. The Biosocial Study shows, then, that even in a racially and environmentally homogenous sample of individuals, environmental factors predominate in predicting who will be a criminal and who will not.

## 2. *Reconsidering Frank X's Case History*

In light of the Biosocial Study's results, it may be informative at this point to reconsider Frank X's individual case history which was based on information gathered from a variety of sources: the psychological and medical tests administered to Frank during the Collaborative Perinatal Project, as well as an experienced social worker's observations of Frank and extensive home interviews with Frank's mother. The social worker's observations and interviews were scheduled every four months during the first year of Frank's life, and then every six months until his eighth birthday, providing a total of sixteen scheduled interviews.

An overview of Frank's record shows that during his school years Frank demonstrated consistently low intelligence and achievement test scores. His scores on the Stanford-Binet and the Wechsler Intelligence Scale for Children were borderline. He ranked at the bottom level on his language achievement.<sup>37</sup>

A striking feature of Frank's record, however, was his severe

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34. See *infra* notes 76-82 and accompanying text.

35. DENNO, BIOLOGY AND VIOLENCE, *supra* note 2, at 63-64.

36. *Id.* at 7-15.

37. *Id.* at 109.

speech problem at an early age, although the examiners made no mention of any medical attempts to help him. Repeatedly, Frank was described by his mother, the home interviewers, and all psychological and medical examiners, as speech disordered and nearly unintelligible. At his age four exam, for example, the psychologist-examiner noted that Frank's mouth was "abnormal" and that he had a "severe articulation problem." These difficulties supported the examiner's assessment that the Stanford-Binet was "over [Frank's] head" and that he was simply unable to verbalize his answers. At Frank's age seven exam another examiner described him as being "almost unintelligible," although he was cooperative with the examiner and "refuses to admit that he has difficulties with certain tasks." At age eight Frank was completely unable to be tested for the speech exam because of a "severe articulation problem."<sup>38</sup>

Also at an early age Frank showed evidence of attention deficit disorders that have been found by some researchers to be attributed to a deprived environment. For example, at seven months, he banged his head against the side of the crib and rocked himself to sleep each night. His head banging and rocking continued through childhood, and often when he was angry.<sup>39</sup>

There were also a number of familial and environmental problems in Frank's family. His family was large, survived on welfare and showed a history of moving frequently. Moreover, Frank's housing situation appeared to be continually deprived. In one record his home was "in very poor condition"; in another it was in a "poor, tough, neighborhood"; in yet another the house was characterized as "one of the few on the block which is not condemned."<sup>40</sup> Most likely these environmental conditions contributed to Frank's lead poisoning, which in turn could possibly have affected his intelligence and achievement test scores, his speech problems, and his early behavioral disorders.

Despite these conditions, Frank was consistently rated as friendly and pleasant during examination situations and at home interviews. At age four, he was described as "cooperative" during the exam,

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38. *Id.*

39. Head banging and body rocking are behaviors that are typically found among autistic, mentally retarded, or environmentally deprived children, although normally developing infants may also show such behaviors. Whether or not such behavior is considered pathological or a normal part of development depends upon the child's age. Although such behavior can be a part of play and physical exercise among healthy infants, it may be retained if children are raised in an environment deprived of the kind of stimulation appropriate for their developmental level. *See id.* at 105-06.

40. DENNO, BIOLOGY AND VIOLENCE, *supra* note 2, at 110.

although frustrated because so many of the tasks were beyond his abilities verbally. At age five and one-half, the social worker described him as "not shy, attractive, friendly and responsive." At age seven he appeared not to be "particularly embarrassed or inhibited by his severe speech problem in the test situation." In general, he was "an eager, cooperative boy who enjoyed all tasks and tried very hard at everything." During examination situations he also appeared to be affectionate and to enjoy affection in return from others.<sup>41</sup>

The noncriminal "control" subject that was compared to Frank also evidenced physical and familial handicaps, but their number and severity were substantially less.<sup>42</sup> Although the control subject experienced many of Frank's disadvantages, such as low test scores and problems with attention span, by the time the subject was four years old his family went off welfare and his father entered the armed services. The control subject's case records mentioned that when he was age five the family moved to Europe to spend the summer with his stepfather. Despite some difficulties with school work, the control child was described as pleasant and evidenced no behavioral problems. This child's environmental stability appeared to be critical to his remaining crime-free.<sup>43</sup>

Given the potential impact of environmental factors on Frank and his control, the next section examines more thoroughly the research and literature on the possible effects of the urban environment on children's behavior. The section particularly emphasizes the documented influences of lead poisoning on urban-dwelling black children.

### III. Lead Poisoning and the Urban Environment

The evidence of lead poisoning in Frank X's case history, as well as the link between lead poisoning and the three "problem behavior" variables in the Biosocial Study, prompts consideration of the significance of this result in light of other features of the urban environment. Although the Biosocial Study's subjects were born between 1959-1962, they were examined during the course of twenty-four years, therefore until, respectively, 1983-1986. Any changes in environmental conditions for minorities during that quarter century in Philadelphia or other large cities should have been for the better

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41. *Id.* at 111.

42. The noncriminal "control" subject that was compared to Frank had scores that were very similar to his with respect to three key factors: (1) the verbal portion of the Wechsler Intelligence Scale for Children; (2) language achievement in school; and (3) family income. *Id.* at 102-03.

43. *Id.* at 111-12.

economically, although how much so is difficult to measure.<sup>44</sup>

Moreover, in Philadelphia and other large cities different kinds of problems have developed. For example, homelessness,<sup>45</sup> drug abuse,<sup>46</sup> and the social isolation of the ghetto<sup>47</sup> have increased substantially since the 1960s. As this section discusses, there is also evidence to suggest that such environmental hazards as lead toxicity may not have declined appreciably if at all, given accounts of its ongoing presence among urban minorities in Philadelphia and elsewhere.<sup>48</sup>

### A. The Makings of "Environmental Racism"

Recent articles have depicted the ongoing, devastating environmental circumstances of the urban minority poor who commonly reside in run-down housing that contains lead- or mercury-based paint, or who live near hazardous waste sites.<sup>49</sup> According to one commentator, such hazards as lead and waste sites "have been occurring in minority communities with such frequency and predictability that they are being attributed to 'environmental racism.'"<sup>50</sup>

The term "environmental racism" was first used in 1987 by Dr. Benjamin F. Chavis, Jr., Executive Director of the United Church of Christ's Commission for Racial Justice, in order to characterize the results of the Commission's nationwide study on race and waste distribution.<sup>51</sup> The Commission's study reported a "consistent national

44. See LANE, *supra* note 15, at 374-409; William J. Wilson, *The Ghetto Underclass and the Social Transformation of the Inner City*, in THE BLACK SCHOLAR at 10-11 (May/June 1988); see generally WILLIAM J. STULL & JANICE FANNING MADDEN, POST-INDUSTRIAL PHILADELPHIA: STRUCTURAL CHANGES IN THE METROPOLITAN ECONOMY (1990).

45. See generally Elaine R. Fox & Lisa Roth, *Homeless Children: Philadelphia as a Case Study*, 506 ANNALS AM. ACAD. POL. & SOC. SCI. 141 (1989).

46. See, e.g., Michael deCourcy Hinds, *Pennsylvania City Hopes It's Bouncing Back From the Bottom*, N.Y. TIMES, Jan. 5, 1992, at A14; Tom Morganthau, *Children of the Underclass*, NEWSWEEK, Sept. 11, 1989, at 16.

47. Wilson, *supra* note 44, at 14-16.

48. See *infra* notes 49-68 and accompanying text.

49. See, e.g., Paul Mohai & Bunyan Bryant, *Race, Poverty, and the Environment*, 18 EPA J. 6-8 (1992); Jane Perkins, *Recognizing and Attacking Environmental Racism*, 26 CLEARINGHOUSE REV. 389, 389 (1992); Robert Suro, *Pollution-Weary Minorities Try Civil Rights Tack*, N.Y. TIMES, Jan. 11, 1993, at A1, B7.

50. Perkins, *supra* note 49, at 389.

51. COMMISSION FOR RACIAL JUSTICE, UNITED CHURCH OF CHRIST, TOXIC WASTES AND RACE IN THE UNITED STATES: A NATIONAL REPORT ON THE RACIAL AND SOCIO-ECONOMIC CHARACTERISTICS OF COMMUNITIES WITH HAZARDOUS WASTE SITES (1987) [hereinafter TOXIC WASTES AND RACE]; see also Mohai & Bryant, *supra* note 49, at 7; Dorcetta Taylor, *The Environmental Justice Movement*, 18 EPA J. 23-25 (1992); UNITED CHURCH OF CHRIST, COMMISSION FOR RACIAL JUSTICE, PROCEEDINGS: THE FIRST NATIONAL PEOPLE OF COLOR ENVIRONMENTAL LEADERSHIP SUMMIT (Charles Lee ed., 1991).

pattern" showing race "to be the most significant among variables tested in association with the location of commercial hazardous waste facilities,"<sup>52</sup> even when taking into account socioeconomic factors, such as average household income and average value of homes.<sup>53</sup> In determining that it was "virtually impossible" that such a result would occur by chance, the Commission concluded that racial biases influenced the location of waste facilities.<sup>54</sup>

Whether or not "racism" accounts for the disproportionate exposure of minority groups to lead poisoning and hazardous wastes is an issue open to debate.<sup>55</sup> There is, however, ample support for emphasizing the serious consequences of lead levels in children not only because of the results of the Biosocial Study reported in this Essay. According to top officials of the former Bush administration, "lead poisoning is now being called the nation's No. 1 environmental threat to children."<sup>56</sup> Indeed, in light of statistics indicating that one out of nine children is adversely affected by lead, Dr. Louis Sullivan, former Secretary of Health and Human Services confirmed the former Bush administration's conclusion: "Lead poisoning is entirely preventable, yet it is the most common and socially devastating environmental disease of young children."<sup>57</sup>

Although children of all socioeconomic classes are susceptible to the effects of lead,<sup>58</sup> urban-dwelling black children appear to be most at risk.<sup>59</sup> Moreover, race appears to be a stronger risk factor than

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52. TOXIC WASTES AND RACE, *supra* note 51, at xiii; see also Alice M. Brown, "Environmental Racism": Fact or Fiction?, 12 ENVTL. L. 1 (Fall/Winter 1992-93) (citing the United Church of Christ study).

53. TOXIC WASTES AND RACE, *supra* note 51, at xiii; see also Mohai & Bryant, *supra* note 49, at 7.

54. TOXIC WASTES AND RACE, *supra* note 51, at 23.

55. See, e.g., Barbara R. Arnwine & Thomas J. Henderson, *Environmental Justice: A Challenge to the Environmental and Civil Rights Community*, 12 ENVTL. L. 4-5 (1992-93); Matthew Rees, *The Birth of 'Eco-racism': Black and Green*, NEW REPUBLIC, Mar. 2, 1992, at 15-16; Dick Russell, *Environmental Racism*, AMICUS J. 22-32 (1989); David Sive, *An Environmental's View of 'Environmental Racism'*, 12 ENVTL. L. 5-6 (1992-93); Nathalie Walker & Michael Traynor, *The Environmental Justice Movement: Two Cases in Point*, 12 ENVTL. L. 3, 304 (1992-93); Michael Weisskopf, *Minorities' Pollution Risk is Debated; Some Activists Link Exposure to Racism*, WASH. POST, Jan. 16, 1992, at A25.

56. Steven Waldman, *Lead and Your Kids*, NEWSWEEK, July 15, 1991, at 42, 43; see also Philip Hiltz, *U.S. Opens a Drive to Wipe Out Lead Poisoning Among Children*, N.Y. TIMES, Dec. 20, 1990, at A1.

57. Waldman, *supra* note 56, at 44.

58. See Peter A. Baghurst et al., *Environmental Exposure to Lead and Children's Intelligence at the Age of Seven Years*, 327 NEW ENG. J. MED. 1279, 1282-83 (1992); Jane E. Brody, *Study Documents Lead-Exposure Damage in Middle-Class Children*, N.Y. TIMES, Oct. 29, 1992, at A20.

59. David Bellinger et al., *Longitudinal Analyses of Prenatal and Postnatal Lead Exposure and Early Cognitive Development*, 316 NEW ENG. J. MED. 1037, 1037 (1987).

poverty. For example, the Environmental Protection Agency noted in a recent report that although researchers were unable to link racial differences in death and disease to environmental factors, the "notable exception" was childhood lead poisoning.<sup>60</sup> Across all socioeconomic groups, "a significantly higher percentage of Black children compared to White children have unacceptably high blood levels."<sup>61</sup>

Poverty is an aggravating circumstance in the lead poisoning and race link, however. According to the Environmental Defense Fund, over 67% of black inner city children have been contaminated by excessively high levels of lead.<sup>62</sup> Using a stricter measure of high level toxicity based upon dentine lead (measured from teeth), one large study of Philadelphia school children in 1971 also showed that black children from public schools who resided in areas with poor housing had "marked elevations" of dentine lead; in addition, 20% of the children had lead levels in ranges associated with toxicity.<sup>63</sup>

Lead in Philadelphia is still a problem, as one large scale study<sup>64</sup> and one recent case demonstrated in its detailed account of an urban black child who suffered brain damage as a result of a year of continuously eating the sweet-tasting paint in his home.<sup>65</sup> Moreover, it has been estimated that 80% of New York City's public schools still contain lead paint.<sup>66</sup> As the Committee on Environmental Hazards emphasized, the incidence of lead poisoning among children is "particularly prevalent in areas of urban poverty."<sup>67</sup> Thus, "[l]ead exposure is at once a by-product of poverty and a contributor to the cycle that perpetuates and deepens the state of being poor."<sup>68</sup>

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60. U.S. ENVIRONMENTAL PROTECTION AGENCY, ENVIRONMENTAL EQUITY: REDUCING RISK FOR ALL COMMUNITIES, 230-R-92-008, at 11-12 (June 1992) [hereinafter USEPA].

61. *Id.* at 11.

62. Perkins, *supra* note 49, at 394 (citing the Environmental Defense Fund).

63. Herbert L. Needleman et al., *Subclinical Lead Exposure in Philadelphia School-children*, 290 NEW ENG. J. MED. 245 (1974); see also Philip J. Landrigan & John W. Graef, *Pediatric Lead Poisoning in 1987: The Silent Epidemic Continues*, 79 PEDIATRICS 582, 582 (1987) (noting that between 1976 and 1980, the prevalence of increased lead absorption among black preschool children was 24.5%).

64. See Needleman et al., *supra* note 63, at 246 (reporting that children residing in the "lead belt" of urban Philadelphia evidenced nearly five times the concentration of lead than their suburban counterparts).

65. Susan FitzGerald, *Poisoned: A Mother Presses Without Success to Wrest Her Son Free of Lead Paint*, PHILA. INQUIRER, Aug. 19, 1986, at A1.

66. See N.R. Kleinfield, *Lead Threat Exposes and Engulfs A School*, N.Y. TIMES, Sept. 29, 1992, at A1, B6.

67. Committee on Environmental Hazards, Committee on Accident and Poison Prevention, *Statement on Childhood Lead Poisoning*, 79 PEDIATRICS 457, 457 (1987) [hereinafter, Committee on Environmental Hazards].

68. Perkins, *supra* note 49, at 394 (citing THE CENTERS FOR DISEASE CONTROL,



## B. The Sources and Consequences of Lead Poisoning

Children acquire lead toxicity in various ways. The key source is lead-based paint, which has been outlawed in new buildings, but remains in older homes.<sup>69</sup> Children ingest the paint by eating paint chips<sup>70</sup> or, perhaps more seriously, by swallowing the dust derived from the lead paint which settles on walls, windows, and floors.<sup>71</sup> A newly-released study has confirmed that children evidencing lead-exposure damage were contaminated by lead primarily through their home environments, such as lead-based house paints and lead containing dust from such paint.<sup>72</sup> Other sources of lead toxicity are drinking water, soil, food, gasoline, and industry.<sup>73</sup>

Those factors enhancing an individual's susceptibility to lead toxicity include young age and hand-to-mouth behavior, or nutritional deficiencies of iron, calcium, or zinc.<sup>74</sup> Iron deficiency, whether or not it is accompanied by anemia, "appears to be the single most important predisposing factor for increased absorption of lead."<sup>75</sup>

Lead-exposure can produce devastating physiological and neuro-behavioral disorders among young children, who are far more sensitive to its effects than adults.<sup>76</sup> For example, numerous medical studies have reported that both high and low lead levels have been linked to learning disabilities, delayed nervous system development, deficits in visual motor function, hyperactivity, hypoactivity, and ab-

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PREVENTING LEAD POISONING IN YOUNG CHILDREN 12 (Oct. 1991)); see also Kleinfeld, *supra* note 66, at A1; Robert Pear, *U.S. Orders Testing of Poor Children for Lead Poisoning*, N.Y. TIMES, Sept. 13, 1992, at A1.

69. See Yona Amitai et al., *Hazards of 'Deleading' Homes of Children with Lead Poisoning*, 141 AM. J. DISEASES OF CHILDREN 758, 758 (1987); *Lead-poison Tests Urged for Children*, N.Y. TIMES, Mar. 29, 1991, at A4. Although over two decades have passed since Congress announced that lead-based paint was a health hazard that should be removed from federally subsidized housing, researchers estimate that 900,000 units of public housing still contain the paint. Moreover, approximately 57 million homes still have the paint although Congress banned its use over a decade ago. Hilts, *supra* note 56, at A1.

70. Committee on Environmental Hazards, *supra* note 67, at 459 (According to most pediatricians, "virtually all" cases of serious lead poisoning are due to the consumption of lead paint chips.); but see Joel Schwartz & Ronnie Levin, *Lead: Example of the Job Ahead*, 18 EPA J. 42, 43 (1992) (stating that "most lead poisoning seems to occur from the ingestion of common household dust that has been contaminated by lead," and that it is uncommon for children to be poisoned by eating paint chips).

71. Committee on Environmental Hazards, *supra* note 67, at 457; Schwartz & Levin, *supra* note 70, at 43; Hilts, *supra* note 56, at A1; Kleinfeld, *supra* note 66, at A1, B6.

72. See Baghurst et al., *supra* note 58, at 1279-82.

73. Committee on Environmental Hazards, *supra* note 67, at 457; Perkins, *supra* note 49, at 394; Schwartz & Levin, *supra* note 70, at 43-44; Hilts, *supra* note 56, at B20.

74. Committee on Environmental Hazards, *supra* note 67, at 460.

75. *Id.*

76. USEPA, *supra* note 60, at 9.

normal social and aggressive behavior.<sup>77</sup> Associations between lead and intellectual deficits in particular have also been found among samples of low-socioeconomic status black children comparable to those examined in the Biosocial Study.<sup>78</sup>

Recent research indicates that even relatively low lead levels can have serious effects on the psychological and physiological development of children, which may in turn demonstrate life-long consequences.<sup>79</sup> Thus, in one study, teenagers exposed to lead in elementary school were seven times more likely than those with very low lead levels to drop out of high school, to have lower class standing, and more absenteeism. They were also significantly more likely to evidence deficits in reading ability, vocabulary, fine motor skills, reaction time, and hand-eye coordination.<sup>80</sup> According to the authors of this study, lead exposure in children "may have an important and enduring effect on the success in life of such children and that early indicators of lead burden and behavioral deficit are strong predictors of poor school outcome."<sup>81</sup> A newly released study in Australia concluded that both middle-class and poor children suffer losses in intellectual ability after exposure to even low levels of lead and that such intellectual deficits continued throughout elementary school.<sup>82</sup> Similar results have been reported from a soon-to-be published study in Boston of children from affluent families.<sup>83</sup>

#### IV. Considering a Lead Poisoning Defense

A brief survey of the causes and consequences of lead poisoning, as well as the results of the Biosocial Study, suggests that lead poisoning is pervasive, particularly among blacks in urban communities; that its

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77. See Baghurst et al., *supra* note 58, at 1281-83; Committee on Environmental Hazards, *supra* note 67, at 457; Landrigan & Graef, *supra* note 63, at 582-83; Anthony J. McMichael et al., *Port Pirie Cohort Study: Environmental Exposure to Lead and Children's Abilities at the Age of Four Years*, 319 NEW ENG. J. MED. 468, 474 (1988); Herbert L. Needleman et al., *Deficits in Psychologic and Classroom Performance of Children With Elevated Dentine Lead Levels*, 300 NEW ENG. J. MED. 689, 692-94 (1979); Herbert L. Needleman et al., *Low-level Lead Exposure and the IQ of Children*, 263 JAMA 673, 677-78 (1990); R.O. Pihl & M. Parkes, *Hair Element Content in Learning Disabled Children*, 198 SCIENCE 204, 204-06 (1977); Pear, *supra* note 68, at A1.

78. See Stephen R. Schroeder et al., *Separating the Effects of Lead and Social Factors on IQ*, 38 ENVTL. RES. 144, 149-52 (1985).

79. Herbert L. Needleman et al., *The Long-term Effects of Exposure to Low Doses of Lead in Childhood*, 322 NEW ENG. J. MED. 83, 86 (1990); Mark Jaffe, *Study: Lead Poisoning Scars for Life*, N.Y. TIMES, Jan. 11, 1990, at A1, A4.

80. Needleman et al., *supra* note 79, at 86.

81. *Id.* at 88.

82. Baghurst et al., *supra* note 58, at 1281-83.

83. See Brody, *supra* note 58, at A20 (describing the Boston study).

effects can be debilitating; and that it has been linked to disciplinary problems, aggression, and as the Biosocial Study showed, repetitive and oftentimes violent crime. A question that may be asked, then, is whether lead poisoning could be considered a viable criminal defense for mitigating responsibility.

Comparable kinds of defenses have been successful in some cases. For example, in 1989, a Navajo tribesman, Terrance Frank, won a temporary insanity defense in a federal murder case in which Frank admitted that he shot to death two individuals and then seriously wounded two others in a dispute a year earlier on an Arizona reservation.<sup>84</sup> The public defender contended that Frank had been brain damaged due to uranium-related radiation near his home. He stated that Frank's brain damage, together with the effects of the alcohol that he had ingested the day of the murder, caused Frank to be temporarily insane at the time of the shootings. This defense led the jury to agree on a second-degree murder conviction, concluding that Frank's brain damage and alcohol use precluded premeditation and a first-degree murder conviction.<sup>85</sup> As one expert in the Frank case commented, if such toxins "lead to brain damage . . . the victims could become human time bombs" who are considerably more sensitive to the effects of drugs and alcohol.<sup>86</sup> It is rare that such a defense is raised, however, much less accepted.<sup>87</sup>

The question of whether lead poisoning should be a defense is perhaps most appropriately placed in the context of debates regarding free will, determinism, and the ability of social scientists to predict the course of any one individual's behavior. If social scientists wanted to establish "true" cause and effect relationships between certain factors, such as lead poisoning and crime, they would want to predict all—or 100%—of an individual's future behavior. Such a total degree of prediction is not possible, however, particularly when dealing with human behavior.<sup>88</sup> In the Biosocial Study, comprehensive models of biological and environmental variables predicted 25% of future adult criminality, an acceptable and statistically significant level of prediction. Three quarters of such behavior, however, was left

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84. Charlotte-Anne Lucas, *'Toxin Defense' Successful*, NAT'L L.J., May 1, 1989, at 9; *United States v. Frank*, 956 F.2d 872 (9th Cir. 1991), *cert. denied*, 113 S.Ct. 363 (1992).

85. Lucas, *supra* note 84, at 9.

86. *Id.*

87. *See, e.g., People v. Belcher*, 74 Cal. Rptr. 602, 605 (1969) (stating that a defendant suffering brain damage from lead poisoning was not insane when he committed a burglary because "abnormal" behavior was not the same as insanity).

88. Establishing reliable levels of prediction is a problem in most scientific research. *See generally* JOHN MONAHAN & LAURENS WALKER, *SOCIAL SCIENCE IN LAW* (1990).

unexplained.<sup>89</sup>

### A. Interpreting Unexplained Behavior

This Essay will consider two possible ways of interpreting such unexplained behavior. First, those who believe in a philosophy of "full determinism" state that theoretically it is possible to predict all of an individual's behavior, but social scientists are currently aware of only a small number of behavioral-causing factors.<sup>90</sup> "Full determinists" would contend that a lead poisoning defense would be untenable because there may be comparably severe deficiencies that individuals possess that are simply not yet known to social scientists or others investigating the causes of crime. Moreover, it could be argued that all criminal behavior could be excused or defended if we could simply find the causal factors for it. As Moore notes, such an argument results in the "absurd conclusion that no one is responsible for anything,"<sup>91</sup> and therefore no one can be punished.

A second view, perhaps represented by a philosophy of "degree determinism," suggests that varying degrees of free will and determinism exist in all actions depending on the impact of various biological and environmental forces. Therefore, degree determinism may be defined as the "degree of freedom of choice on a continuum from the hypothetically entirely rational to the hypothetically pathologically determined — in states of consciousness neither polar condition exists."<sup>92</sup> With regard to the issue of criminal defenses, "degree determinists" must consider when an individual's behavior is so beyond that individual's control that it is no longer blameworthy. In other words, at what point along this continuum does responsibility end and excuse begin?

### B. When Does Excuse Begin?

According to Norval Morris, external pressures, such as social adversity, have a much more powerful impact on crime than internal pressures, such as psychosis,<sup>93</sup> although the criminal law favors internally-based excuses.<sup>94</sup> For example, there is no recognized criminal

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89. See DENNO, *BIOLOGY AND VIOLENCE*, *supra* note 2, at 89-92.

90. This viewpoint is a modification of that discussed by Michael Moore. See Michael S. Moore, *Causation and the Excuses*, 73 CALIF. L. REV. 1091, 1118-19 (1985).

91. *Id.* at 1092.

92. NORVAL MORRIS, *MADNESS AND THE CRIMINAL LAW* 61 (1982).

93. See *id.* at 61-64. For example, some courts have considered postpartum psychosis as a viable insanity defense. See generally Amy L. Nelson, *Postpartum Psychosis: A New Defense?*, 95 DICK. L. REV. 625 (1991).

94. See MORRIS, *supra* note 92, at 64.

defense based upon socioeconomic deprivation.<sup>95</sup> For this reason, Morris contends that the insanity defense should be abolished because such excuses unjustifiably give "excessive weight to the psychological over the social."<sup>96</sup>

Alternatively, Richard Delgado suggests that a defendant's acts should be partially excused if it can be shown that the conditions that caused them are attributable to society's neglect.<sup>97</sup> Under this "societal fault model," society should be responsible for failing to eliminate particular crime-causing factors that could have been prevented.<sup>98</sup> Similar to negligence cases in some jurisdictions, the jury would be instructed to apportion the degree of fault between society and the individual.<sup>99</sup> The defense would be limited to cases in which the defendant can prove that specific social institutions, such as schools, failed to discharge a duty to the defendant resulting in his or her commission of a criminal offense.<sup>100</sup>

In light of the Biosocial Study's link between lead poisoning and crime, Delgado's argument seems compelling. Lead poisoning, largely an environmental and societally-created problem, was a leading predictor of both juvenile and adult crime, as well as disciplinary problems in school.<sup>101</sup> Furthermore, although lead toxicity is preventable, efforts to eliminate lead have had limited success.<sup>102</sup>

Regardless, Delgado's reasoning is not flawless. Given scientists' limited abilities to predict behavior, it is as yet unknown what other factors may be significant in causing crime. In line with the full determinists, scientists simply may not know the "true" causes of crime since so much of an individual's behavior is left unexplained.<sup>103</sup> The danger is that the criminal law may be providing a defense for those who are truly culpable and who actually do have sufficient self-control over their behavior.

### C. The Myth of the Internal-External Distinction

Given this position, then, why should the criminal law retain defenses for those behaviors that appear to have an internal, rather than

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95. See Richard Delgado, "Rotten Social Background": *Should the Criminal Law Recognize a Defense of Severe Environmental Deprivation?*, 3 L. & INEQUALITY 9 (1985).

96. MORRIS, *supra* note 92, at 64.

97. See generally Delgado, *supra* note 95.

98. *Id.* at 89.

99. *Id.*

100. *Id.*

101. See *supra* notes 29-36 and accompanying text.

102. See, e.g., *supra* note 69.

103. See *supra* notes 88-89 and accompanying text.

an external, cause? Morris may be correct in stating that internal factors are preferred as criminal law defenses, yet there is no evidence that they are any stronger determinants of an individual's behavior. Perhaps internal factors are appealing from a white, middle-class standpoint because white middle-class individuals are disproportionately less exposed to the hazards of the urban environment. Alternatively, internal factors may be more appealing because they appear to be more tangible, hence more "causal." As a recent New York case demonstrated, a PET scan of a brain cyst can have a potentially highly influential effect on a jury's consideration of whether or not a defendant was insane at the time he engaged in murder<sup>104</sup> most likely because the source of his aberrant conduct seems so clear.

Furthermore, it remains to be considered the extent to which some environmental forces, such as lead poisoning, produce internal disorders, such as neurodevelopmental delay or hyperactivity. A knowledgeable defense attorney could legitimately transform what appears to be an externally produced disorder, such as lead poisoning, into an internally produced one, claiming that the defendant's behavior was due to the brain damage or neurological dysfunction that the lead induced. This was the strategy used in the Terrance Frank case, and perhaps for this reason that strategy was influential. Consider, however, the disadvantages faced by those attorneys who are not so knowledgeable about the consequences of externally produced events.

Perhaps, however, the issue is not "causal appeal" but the fact that what appear to be internally produced stresses, such as brain cysts, occur less frequently than those that are externally produced, such as lead poisoning and other environmental toxins. Indeed, if we were to allow for a defense based upon "rotten social background," nearly every poor minority who has committed a crime would be found less culpable since a wealth of social science research suggests that most criminals are environmentally deprived.<sup>105</sup>

This prompts another question: Is infrequency of occurrence or "exoticism" a proper rationale for allowing a criminal defense to be acceptable? Exoticism may be the basis for some of the successful defense strategies based on post partum psychosis.<sup>106</sup> But if this is a factor, then the lead poisoning defense may be appealing to juries because it has a limited history in criminal trials.

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104. *People v. Weinstein*, 591 N.Y.S.2d 715 (1992); Cerisse Anderson, *Brain Scan Deemed Admissible At Trial; Guilty Plea Follows Insanity Defense Ruling*, N.Y. L.J., Oct. 20, 1992, at 1.

105. *See supra* note 24.

106. *See, e.g., Nelson, supra* note 93.

Or is the apparent focus on exoticism simply the criminal law's way of allowing some recognition, and therefore allowance, for human frailty without setting the majority of wrong-doers free? However, if mitigation or allowances are based on such calculations and causal fictions, could this practice undermine the philosophy and purpose of the criminal law? Perhaps it would simply be more just to discard defenses based upon both internal and external factors, recognizing that although both may cause crime, it is unfair to allow only for those factors (internal) that occur less frequently albeit no more forcefully than those factors (external) that may be responsible for determining a large proportion of law-breaking.

#### **D. A Philosophical Balance**

Alternatively, the criminal law could simply examine the harm done and judge that harm in accordance with society's values. Indeed, forensic psychiatrists insist that the culpability of the extremely violent offender should be assessed according to philosophical concerns, not legal or scientific estimates of causation. In this vein, for example, it could be recommended that the criminal law should never provide a defense for a mother who kills her infant, whether or not the mother claimed that her actions were due to internal factors, such as post partum psychosis, or external factors, such as economic deprivation. Such an act would not comport with our philosophy of valuing infants' lives; there would simply be no excuse available.

There may be problems with this suggestion as well. The criminal law's judgments of what acts are philosophically or morally reprehensible may be just as unfair and class-based as its apparent distinction between internal and external causation. Therefore, acts of the middle-class may be viewed as comporting with our philosophies whereas acts of the lower classes may not be. This approach would provide no solution and only perpetuate the unfairness that already exists.

It may be considered that eliminating both internal and external types of defenses could ease the class bias that pervades the criminal justice system in light of the fact that most internally-caused variables will be linked to the white and the middle-class who have no (or very limited) experience with the environmental forces affecting the minority and urban communities. However, this approach appears to be extraordinarily harsh. Taken to its extreme, there would be no defense for anyone. It could be considered that this approach would be unfair because it would not comport with society's and the criminal law's determination that not all behavior is based on free will.

## V. Conclusion

A possible solution is to retain the insanity defense because the criminal law considers it unfair to punish those who, more clearly than not, do not act on their own free will.<sup>107</sup> Moreover, both the frequency and the success rate of the insanity defense are very low.<sup>108</sup> Based upon the findings and positions presented in this Essay, it is further recommended that the criminal law's conception of insanity be premised upon both internal as well as external factors, recognizing the significance of both on behavior. A lead poisoning defense would be viable with this approach if a jury determined that the lead effect significantly contributed to a defendant's loss of control. Although empirical research on the effects of lead on behavior could enlighten a jury in its decision-making, jury instructions would need to make clear that such research does not establish causation.

Alternatively, it may be considered that criminal law defenses falling outside of the insanity defense should be restricted or perhaps eliminated altogether because they appear to be based upon misguided notions of causation in light of the positions presented by the full and degree determinists. Such factors could be considered at sentencing, however, to determine whether efforts should be made to rehabilitate or simply punish. Given this recommendation, an individual suffering from lead poisoning could request particular methods of rehabilitation, such as special education, based on evidence that lead in that defendant's environment contributed to the academic difficulties.

These recommendations support the adoption of an "all-or-none test of criminal responsibility."<sup>109</sup> Using this test, the criminal law would deem not guilty only a small percentage of insane individuals.<sup>110</sup> Given the position of this Essay, the criteria used to determine insanity would be based upon both internal and external factors. In turn, those individuals evidencing less serious disorders would have a level of criminal responsibility comparable to their sane peers.<sup>111</sup> Not only would this system of criminal justice have the appearance of fairness, it would also actually be more fair, given its closer link to the reality of human behavior, what little we know of it.

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107. See Ingo Keilitz, *Researching and Reforming the Insanity Defense*, 39 RUTGERS L. REV. 289, 293 (1987).

108. See *id.* at 290; *United States v. Lyons*, 739 F.2d 994, 995 (5th Cir. 1984) (Rubin, J., dissenting).

109. Stephen Morse, *Undiminished Confusion in Diminished Capacity*, 75 J. CRIM. L. & CRIMINOLOGY 1, 34 (1984).

110. *Id.*

111. *Id.*



**Table I**  
**Predictors of Juvenile and Adult Crime<sup>112</sup>**

*Factors Predicting Adult Crime*

- (1) Number and seriousness of juvenile offenses
- (2) Father's low educational level
- (3) Mother's low educational level
- (4) **Lead poisoning**
- (5) Number of gaps in the father's employment history

*Factors Predicting Juvenile Crime*

- (1) Number of disciplinary problems in school
- (2) Amount of time the father was unemployed
- (3) **Lead poisoning**
- (4) Abnormal speech
- (5) Low language achievement

*Factors Predicting Disciplinary Problems in School*

- (1) **Lead poisoning**
- (2) Anemia
- (3) Left-handedness
- (4) Foster parent status
- (5) Frequent household moves

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112. These factors are presented in order of decreasing "statistical significance." Statistical significance refers to the probability that a particular result occurred by chance. All factors were at least significant at the .05 level, the standard significance level for social science research. Therefore, 5 times out of 100, a factor that appeared to be significant would really not be; the apparent significance would only be by chance. See MONAHAN & WALKER, *supra* note 88, at 80-81; NEALE & LIEBERT, *supra* note 3, at 62-63.