

10-2003

The Cloudy Crystal Ball: Genetics, Child Abuse, and the Perils of Predicting Behavior

Robert D. Stone

Follow this and additional works at: <https://scholarship.law.vanderbilt.edu/vlr>



Part of the [Law and Society Commons](#), and the [Medical Jurisprudence Commons](#)

Recommended Citation

Robert D. Stone, *The Cloudy Crystal Ball: Genetics, Child Abuse, and the Perils of Predicting Behavior*, 56 *Vanderbilt Law Review* 1557 (2019)

Available at: <https://scholarship.law.vanderbilt.edu/vlr/vol56/iss5/6>

This Note is brought to you for free and open access by Scholarship@Vanderbilt Law. It has been accepted for inclusion in *Vanderbilt Law Review* by an authorized editor of Scholarship@Vanderbilt Law. For more information, please contact mark.j.williams@vanderbilt.edu.

The Cloudy Crystal Ball: Genetics, Child Abuse, and the Perils of Predicting Behavior

I.	INTRODUCTION	1558
II.	UNDERSTANDING THE CYCLE OF VIOLENCE	1561
	A. <i>The Cycle</i>	1561
	B. <i>Factors in Behavior</i>	1561
III.	UNDERSTANDING THE GENETIC COMPONENT OF BEHAVIOR	1563
	A. <i>The Deterministic Approach</i>	1563
	B. <i>Unintended Consequences</i>	1565
	1. Stigma and Genetic “Inferiority”	1565
	2. Fear of Discrimination	1566
	3. Reality, Hysteria, or Both?.....	1567
IV.	THE CASPI APPROACH: AN ALTERNATIVE TO GENETIC DETERMINISM.....	1568
	A. <i>Study Procedures</i>	1568
	B. <i>Study Results</i>	1569
	C. <i>Predictive Limitations</i>	1570
V.	SHOULD TESTING FOR THE “CASPI PREDISPOSITION” BE ALLOWED AT ALL—A THRESHOLD QUESTION	1571
	A. <i>Analytical Validity</i>	1572
	B. <i>Clinical Validity</i>	1573
	C. <i>Clinical Utility</i>	1574
	D. <i>Social Consequences</i>	1575
	E. <i>Conclusion on the Threshold Question</i>	1575
VI.	HYPOTHETICAL CASE STUDY	1576
	A. <i>Issues for Physicians Involved in Abuse Investigation</i>	1576
	B. <i>Issues for the State Child Welfare Department</i>	1577
VII.	RECOMMENDATIONS	1578
	A. <i>Physician Self-Regulation Through Ethical Guidelines</i>	1578
	1. Decision to Test	1578
	2. Refusal to Test.....	1580
	3. Treatment Issues.....	1581
	B. <i>Regulations Within the Child Welfare System</i>	1582

1.	Limiting When and How to Conduct the Test.....	1582
	<i>a. Only As Part of an Active Abuse Investigation</i>	1582
	<i>b. Only Under Physician Supervision ..</i>	1583
2.	Require Assignment of a Guardian ad Litem	1584
3.	Provide Genetic Counseling	1584
4.	Use of the Information in Disposition Decisions	1585
	<i>a. An Equality Approach</i>	1585
	<i>b. Understanding the Past, Not Predicting the Future.....</i>	1586
5.	Release of the Information to Third Parties	1587
VIII.	CONCLUSION.....	1588

I. INTRODUCTION

In the cinematic world of *Minority Report*, mankind stands on the brink of a society without murder.¹ Police can see the future, predicting murders and arresting perpetrators before they act.² This utopian system is the ultimate evolution in preventative policing because it offers perfect prediction; it does not show what people intend to do, only what they will do.³ Society accepts the incarceration of pre-murderers, people who have committed no crimes, because there is no such thing as the “wrongfully accused.”⁴ Is the ability to predict behavior only science fiction, or can a combination of genetic and environmental factors actually identify future criminals?

In 2000, almost 900,000 children were victims of maltreatment in the United States.⁵ Many will grow up to become fully productive

1. MINORITY REPORT (Twentieth Century Fox 2002). *Minority Report* depicts a near future society where police are able to see the future and arrest “pre-criminals” before they commit murder. The plot revolves around questions of ethics, policy, and accuracy in trying to predict behavior.

2. *Id.*

3. *Id.*

4. *Id.*

5. See Press Release, U.S. Department of Health and Human Services, Year 2000 Child Abuse and Neglect Findings Released (Apr. 19, 2002), available at <http://www.acf.hhs.gov/news/press/2002/abuse.html>.

citizens while others will lead lives of antisocial or violent conduct.⁶ We have never before been able to definitively identify the future criminals.⁷ But now, because of the union of genetics and behavioral science, society may be on the brink of allowing us to identify those abused children that will, one day, commit violent acts.⁸

Science recently published an article entitled "Role of Genotype in the Cycle of Violence in Maltreated Children" ("Caspi Study").⁹ Using a study of over 500 boys, researchers asked whether the presence of a certain genotype (MAOA low) combined with exposure to childhood maltreatment would result in increased levels of antisocial behavior.¹⁰ Results showed the greatest incidence of antisocial behavior in the boys who both possessed the genotype and experienced childhood maltreatment.¹¹ This confirmed the researchers' hypothesis that, to some extent, genetics can protect a child from the psychological effects of maltreatment.¹² If validated, this research could lead to the development of tools that distinguish between future offenders and future productive citizens.

This Note examines the peril and promise of such efforts to predict behavior. Although the predictive power of genetics has been discussed many times before, the Caspi Study may prove to be the beginning of a new era. Historically, our culture has understood behavior to be the result of either biology or environment, of nature or nurture.¹³ The Caspi Study, by incorporating both nature and nurture factors in its conclusions, disarms the extremists in both camps.

When the study's comprehensive approach is coupled with the iconic position of genetics in our society, the legal, ethical, and moral dilemmas multiply rapidly. How well do we as a society truly understand the "science" of prediction? Can it and should it be relied upon? What interests should guide our decisions when faced with predictive genetic information? For example, when addressing the

6. See generally Avshalom Caspi et al., *Role of Genotype in the Cycle of Violence in Maltreated Children*, 297 SCI. 851 (2002) (discussing maltreatment as a risk factor for anti-social behavior, but noting that most maltreated children do not become violent).

7. *Id.*

8. See generally *id.* (studying interactive effect of genetics and exposure to childhood maltreatment on development of antisocial conduct).

9. *Id.* at 851.

10. *Id.* at 852. The study examined four measures of antisocial conduct including diagnosis of Conduct Disorder, according to criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV); convictions for violent crimes; personality disposition toward violence; symptoms of Anti-Social Personality Disorder. *Id.*

11. *Id.* at 852-53.

12. *Id.* at 852.

13. Rochelle Cooper Dreyfuss & Dorothy Nelkin, *The Jurisprudence of Genetics*, 45 VAND. L. REV. 313, 340 (1992) (discussing the history of the "nature/nurture" debate).

needs of an abused child who tests positive for the violence-prone genotype, does the State's interest in preventing violence trump the child's interest in being free from government intervention? Should the Caspi Study's general conclusions even be applied to individual children at all?

Not surprisingly, evidence of a genetic predisposition for violence is consistent with stereotypes many people already hold. One potentially negative outcome of the Caspi Study is that it appears to lend scientific credibility to those inclined to use labels such as "bad kids," "bad blood," or "criminal genes." Tagging children with negative labels may result in stigma, discrimination, and self-fulfilling prophecies. However, the Caspi results may also lead to useful tools for accurately identifying and proactively treating abused children who stand the greatest risk of developing behavioral disorders. While abused children are extremely vulnerable, the general public stands to benefit greatly from a decreased incidence of violence. Without careful forethought, society risks the erosion of legal protections for individual children in the name of preventing violence.

This Note assumes the validity of the research described above, puts it in the context of society's attitude towards genetics in general, and presents recommendations for physicians and State child welfare departments dealing with abused boys who might possess genetic risk factors for future violence. The recommendations incorporate the Caspi Study's contributions but also guard against its more dangerous and misunderstood predictive aspects.

Part II discusses the cycle of violence, focusing on three broad factors that influence behavior. Part III examines the genetic factors presented in Part II and discusses the unintended consequences of the position that genes determine behavior. Part IV presents the Caspi Study as a middle-ground alternative to extreme genetic determinism. This Part also includes a critically important discussion of the predictive limits of genetic research. Part V addresses the threshold question of whether a test for the Caspi predisposition to violence should even be made available. Part VI discusses a hypothetical child abuse investigation as a vehicle to identify legal and ethical issues for physicians and State child welfare departments. Finally, Part VII offers policy-based recommendations for decision makers in the child welfare system. The recommendations will include guidance for physicians in deciding whether or not to conduct genetic testing on abuse victims, as well as suggested policies for courts to safeguard

victims' rights while appropriately utilizing predictive genetic information.¹⁴

II. UNDERSTANDING THE CYCLE OF VIOLENCE

A. *The Cycle*

In exploring the implications of the Caspi Study, it is important to understand the dynamics of intergenerational violence.¹⁵ For years, studies have shown a correlation between exposure to childhood abuse and ensuing antisocial behavior, without any consideration of genotype.¹⁶ "The cycle" describes this basic propensity for an abused child to grow up to become an abusive parent, whose abused children are more likely to become abusive themselves, continuing for generations.¹⁷ The Caspi Study corroborated this general result.¹⁸ This cycle, however, does not appear to operate in every case; not all children exposed to abuse later become aggressive. Therefore, factors beyond an abusive childhood environment must be involved.¹⁹

B. *Factors in Behavior*

One additional factor is the individual's free will.²⁰ Therapists working with abuse victims focus on this factor by providing cognitive

14. The moral and doctrinal questions that arise from the use of genetic information in assessing criminal culpability will only be discussed tangentially, as other commentators have examined it at length. See, e.g., Marcia Johnson, *Genetic Technology and Its Impact on Culpability for Criminal Actions*, 46 CLEV. ST. L. REV. 443 (1998); Amanda R. Evansburg, Note, "But Your Honor, It's in His Genes": *The Case for Genetic Impairments as Grounds for a Downward Departure Under the Federal Sentencing Guidelines*, 38 AM. CRIM. L. REV. 1565 (2001).

15. Katherine C. Pears & Deborah M. Capaldi, *Intergenerational Transmission of Abuse: A Two-Generational Prospective Study of an At-Risk Sample*, 25 CHILD ABUSE & NEGLECT 1439, 1440 (2001) ("[R]esearchers have found support for the idea that children who experience harsh or abusive parenting are likely to become harsh and abusive parents.")

16. "Although maltreatment increases the risk of later criminality by about 50%, most maltreated children do not become delinquents or adult criminals." Caspi et al., *supra* note 6, at 851.

17. See Pears & Capaldi, *supra* note 15, at 1440.

18. See Caspi et al., *supra* note 6, at 852-53 ("The main effect of MAOA activity on the composite index of antisocial behavior was not significant . . . whereas the main effect of maltreatment was significant.")

19. See *id.* at 853 ("[S]ome youngsters make the progression [from childhood maltreatment to later criminal violence], but others do not . . ."); Pears & Capaldi, *supra* note 15, at 1440 ("[E]stimated rates of transmission vary widely. . .").

20. See Hugh Miller, III, *DNA Blueprints, Personhood, and Genetic Privacy*, 8 HEALTH MATRIX 179, 182 (1998).

and behavioral tools to help patients make better decisions, manage their anger, and avoid following in their parents' abusive footsteps.²¹

The Caspi Study demonstrates that, in addition to free will, the difference between those who break the cycle of abuse and those who do not turns on the victim's genetic predisposition.²² While the Study does not discount the role of free will, it argues that the ease with which an individual can choose a non-violent life is influenced by his genes.²³ Both free will and genetics can mitigate the effects of an abusive childhood.²⁴

The Caspi Study suggests that models for predicting who will exhibit antisocial behavior should include environmental factors, genetic factors, and individual free will.²⁵ While the first two factors may result in accurate predictions across populations (e.g., 80% of the severely maltreated and low MAOA genotype group will grow up to exhibit anti-social behavior), the existence of the third factor, free will, presents a confounding variable that drastically reduces predictive power over any individual person's behavior.²⁶

Unfortunately, the belief that genetic predispositions are the determinative factor has been widely circulated.²⁷ The more extreme deterministic position has dominated public discourse with unfortunate and likely unintended consequences, as discussed in the next section.²⁸

21. See generally Danya Glaser, *Physical, Sexual and Emotional Abuse: Risk, Treatment and Outcome*, 10 CHILD & ADOLESCENT PSYCHIATRY 286 (1997) (discussing cognitive-behavioral treatment techniques and their effectiveness).

22. See generally Caspi et al., *supra* note 6 (finding a statistically significant increase in anti-social behavior for males with a certain genotype who were also mistreated as children).

23. *Id.* at 851.

24. *Id.* Although not the main thrust of the Caspi Study, this point is consistent with its results. See discussion *infra* Part IV.A.

25. Allison Morse, *Searching for the Holy Grail: The Human Genome Project and Its Implications*, 13 J.L. & HEALTH 219, 251, 256 (1998-99) (discussing the role of free will and external events in the expression of behavior).

26. *Id.*

27. See generally *id.* (discussing the trend for legal scholars, the media and prominent scientists to jump on the "reductionist bandwagon" and support the elevation of genetic factors as determinative of human behavior).

28. *Id.*

III. UNDERSTANDING THE GENETIC COMPONENT OF BEHAVIOR

A. *The Deterministic Approach*

The amount of control that genes exert over human behavior has long been debated.²⁹ While theoretical models have described different levels of genetic control, or genetic determinism, only the strongly deterministic view has captured the hearts and fears of the general public.³⁰

The movie *Gattaca* is an ideal tool for understanding strong genetic determinism, a theory that discounts the roles of environment and free will thereby ascribing almost exclusive predictive power to genes.³¹ The film depicts a future where genetic science reigns supreme.³² Almost all children are genetically engineered in-vitro.³³ As a result, parents exercise complete control in designing their children, determining mundane variations such as skin complexion, hair color, eye color, and even eliminating genetic predispositions.³⁴ A geneticist in the film states, "I've taken the liberty of eradicating any potentially prejudicial conditions: premature baldness, myopia, alcoholism, addictive susceptibility, propensity for violence, obesity, etcetera."³⁵ Families that choose not to genetically perfect their children have what is known as an "invalid" or a "faith-based" child whose future is marked by a new generation of genetic discrimination.³⁶ In the film, the predictive power of genes is considered absolute.³⁷ As the main character says, "only seconds old, the exact time and cause of my death was already known."³⁸ Because of this predictive power, discrimination against the un-engineered has become commonplace even though illegal.³⁹

Gattaca unpacks the consequences of a strongly deterministic view of genetics, examining a society where all other behavioral factors are discounted. Reflecting *Gattaca's* attitude, the rhetoric of

29. See Dreyfuss & Nelkin, *supra* note 13, at 340 (discussing the history of the "nature/nurture" debate).

30. See *infra* text accompanying notes 40-52.

31. See Miller, *supra* note 20 at 206.

32. GATTACA (Columbia Pictures 1997).

33. *Id.*

34. *Id.*

35. *Id.*

36. *Id.*

37. *Id.*

38. *Id.*

39. *Id.*

strong determinism has become common in the real news media, as well as in political and scientific discourse.⁴⁰

Popular culture has imbued genes with incredible significance.⁴¹ They are seen as having both predictive and explanatory value⁴² as well as offering tremendous hope for the future of health care and preventative medicine.⁴³ The human genome project⁴⁴ has been likened to the moon landing, to Lewis and Clark's expedition across the West, and to getting a "first glimpse of our own instruction book, previously known only to God."⁴⁵ Still, some commentators argue that the rhetoric has gone too far, that it has overstepped its scientific authority and spun off into the realm of conjecture and hope.⁴⁶ Others fear that freely available genetic information will cause irreparable harm, unprecedented violations of privacy, instances of genetic discrimination, or even a new wave of eugenic programs.⁴⁷

Are these extreme fears and hopes legitimate, or are they based on overstated claims about the potential of genetic information? Are they based on valid science or a misinterpretation of that science by a culture seduced by the predictive promise of DNA?⁴⁸

40. See *infra* text accompanying notes 45-48.

41. DOROTHY NELKIN & M. SUSAN LINDEE, *THE DNA MYSTIQUE: THE GENE AS A CULTURAL ICON* 16 (1995) ("The gene [as defined by popular culture] is, rather, a symbol, a metaphor, a convenient way to define personhood, identity, and relationships in socially meaningful ways. The gene is used . . . to explain health and disease. But it is also a way to talk about guilt and responsibility, power and privilege, intellectual or emotional status. It has become a supergene . . .").

42. Dreyfuss & Nelkin, *supra* note 13, at 343 (discussing the value in distinguishing between predictive and explanatory genetic applications).

43. Sonia M. Suter, *The Allure and Peril of Genetics Exceptionalism: Do We Need Special Genetics Legislation?* 79 WASH. U.L.Q. 669, 675 (2001) (discussing the public "misperception that genetics alone holds the key to eradicating illness").

44. The Human Genome Project is a thirteen year effort coordinated by the Department of Energy and the National Institutes of Health to identify all of the genes in human DNA. See Human Genome Project Information, About the Human Genome Project, at http://www.ornl.gov/sci/techresources/Human_Genome/project/about.shtml (last visited November 4, 2003).

45. *Id.* at 687-88.

46. See NELKIN & LINDEE, *supra* note 41, at 16 ("Clearly the gene of popular culture is not a biological entity. Though it *refers* to a biological construct and derives its cultural power from science, its symbolic meaning is independent of biological definitions."). See *generally* Suter, *supra* note 43, at 687-88 (arguing that viewing genetic information as exceptional or unique is counter-productive and perpetuates inaccurate beliefs about genetics).

47. See *e.g.*, Miller, *supra* note 20, at 183-84.

48. See NELKIN & LINDEE, *supra* note 41, at 165.

B. Unintended Consequences

“Neither genetics nor molecular biology can tell us all that much about people. They can only tell us about our genes.”⁴⁹ Being genetically predisposed to alcoholism does not mean that a person will become a “drunk” any more than a long commute to work destines one for a car crash. When scientists completed mapping the human genome, the result was a spectacular scientific accomplishment. However, due to media reports, the use of religious imagery by scientific figures, and an overzealous popular culture, the public has been encouraged to believe this spectacular science completely defines the human experience. It is the overstatement and misinterpretation of the scientific data, not the scientific data itself that creates real and negative consequences such as those discussed below.⁵⁰

1. Stigma and Genetic “Inferiority”

In *Classify and Control: Genetic Information in the Schools*, Dorothy Nelkin and Laurence Tancredi discuss the dangers inherent in using genetic tests to assess psychological, learning, and behavioral disorders.⁵¹ The authors worry that “conditions having a genetic component are interpreted as if genes were the only determinate influence.”⁵² Further, Nelkin and Tancredi argue that abnormal test results lead to labeling and stigmatizing students as having a permanent and immutable disability.⁵³ Behaviors have incredibly complex etiology; focusing on biological factors “direct[s] attention away from the importance of social interaction in shaping behavior.”⁵⁴

Over-emphasizing biology is an even greater problem for presymptomatic testing for genetic “markers” that point toward the development of a certain disease or disorder.⁵⁵ Especially in the case of behavioral disorders, presymptomatic testing can lead to self-fulfilling prophecies.⁵⁶ One study showed that “[a] person who believes she is an alcoholic, when informed a particular drink contains alcohol, will consume more of the drink than the average person, even

49. Morse, *supra* note 25, at 232.

50. *Id.* at 255 (“[I]t is not the facts that are discovered by science that are the problem, but the interpretation of these facts, the meaning our culture places on them.”).

51. Dorothy Nelkin & Laurence Tancredi, *Classify and Control: Genetic Information in the Schools*, 17 AM. J.L. & MED. 51 (1991).

52. *Id.* at 66.

53. *Id.* at 69.

54. *Id.* at 67, 72-73.

55. Morse, *supra* note 25, at 241-42.

56. *Id.* at 242.

if there is no alcohol in the drink.”⁵⁷ The belief that a negative event is genetically mandated results in decreased self-esteem and feelings of hopelessness and depression.⁵⁸ Such cognitive and emotional disturbances could easily contribute to, or even lead to the development of, the dysfunctional behaviors themselves.⁵⁹

Similarly, studies have shown that other people’s reactions change when they believe an individual has a physical or emotional disability.⁶⁰ For example, parents alter their behavior toward a child diagnosed with a serious disease by increasing protectiveness, refraining from the use of future-oriented language, or in cases where the child is viewed as a “problem,” targeting him for abuse.⁶¹

Not only are the effects of stigma quite real, their potential breadth is universal. “[E]very human being has between 5 and 50 genetic mutations that predispose him or her to disease.”⁶² Every person is genetically inferior when compared to the “perfect” human genome, one which lacks any problematic predispositions. When the prevailing rhetoric of strong determinism is joined with the genuinely harmful effects of genetic stigma, public concerns about genetic privacy and discrimination appear entirely reasonable.

2. Fear of Discrimination

“Whether real or perceived, fear of discrimination and an invasion of privacy exist among Americans concerning genetic testing and the disclosure of the results to third parties,”⁶³ particularly to

57. *Id.*

58. *Id.*

59. *Id.*

60. *Id.*

61. *Id.* at 241-42.

62. 147 CONG. REC. E164 (daily ed. Feb. 13, 2001) (statement of Rep. Louise McIntosh Slaughter) (discussing her reintroduction of the Genetic Nondiscrimination in Health Insurance and Employment Act); see also Kenneth S. Abraham, *Understanding Prohibitions Against Genetic Discrimination in Insurance*, 40 JURIMETRICS J. 123, 125 (1999) (“We all are presymptomatic and predisposed to something.”).

63. Glendora Hughes, *Genetically Incorrect*, 35 MD. B.J. 34, 36-37 (2002). In a 1996 study by researchers at Georgetown University, 87% of participants said they would not want their employers to know that they had received genetic testing, nor have the test results disclosed. *Id.* at 36. A national survey in 1997 found two-thirds of people would not participate in a genetic test if their employers and health insurers would have access to the results, and that 85% believed there should be prohibitions on employers and health insurers gaining access to an individual’s genetic information. *Id.* A survey found that individuals who refused cancer genetics counseling consider their concern about their subsequent ability to get insurance to be the greatest barrier to accessing services. Joanne L. Husted & Janlori Goldman, *The Genetics Revolution: Conflicts, Challenges, and Conundra*, 28 AM. J.L. & MED. 285, 288 (2002). Finally, 25% of people surveyed believed they were denied life insurance due to a genetic disorder; 22%

employers and health insurers.⁶⁴ In addition, these fears have fueled a push for special genetic privacy and antidiscrimination protections.⁶⁵

Some commentators argue that treating genetic information as different from other medical information actually reinforces misconceptions bred by the media and the scientific community.⁶⁶ These arguments lead to the conclusion that genetic information should not be afforded any special legislative protection but should instead be protected by strong, general medical privacy acts.⁶⁷

3. Reality, Hysteria, or Both?

The extent to which fears about genetic discrimination are justified remains unknown.⁶⁸ Some evidence suggests that genetic discrimination in insurance is primarily anecdotal.⁶⁹ Health insurance companies generally do not use results from genetic tests when making coverage or pricing decisions.⁷⁰ In contrast, the public and genetic counselors believe that the risk of genetic discrimination in insurance provision and pricing is very real.⁷¹

Ultimately, stigma and discrimination are grounded in perception, not science. There has been a great deal of public misperception and misinterpretation surrounding genetic research and the human genome project. The result is a cultural climate rife with stigma and ripe for discrimination. In a culture where people are bombarded with news and information about the growing availability

believed they were denied health insurance due to genetic information; and 13% believed they had lost a job due to genetic discrimination. Hughes, *supra*, at 66.

64. See Hughes, *supra* note 63, at 37.

65. See Suter, *supra* note 43, at 670. On October 14, 2003 the Senate unanimously passed the Genetic Information Nondiscrimination Act of 2003, designed to prohibit health insurers and employers from discriminating on the basis of genetic information. Genetic Information Nondiscrimination Act of 2003, S. 1053, 108th Cong. (2003).

66. Suter, *supra* note 43, at 700.

67. *Id.* at 742-43.

68. See Anita Silvers & Michael A. Stein, *An Equality Paradigm for Preventing Genetic Discrimination*, 55 VAND. L. REV. 1341, 1351-52 (2002); Mark A. Hall, *Legal Rules and Industry Norms: the Impact of Laws Restricting Health Insurers Use of Genetic Information*, 40 JURIMETRICS J. 93, 103 (1999). *But see* Silvers & Stein, *supra* at 1349-50 (discussing a case involving the Equal Employment Opportunity Commission and Burlington Railroad, which settled before the court rendered a decision, in which the Railroad secretly conducted genetic testing on employees).

69. See Suter, *supra* note 43, at 681.

70. See Hall, *supra* note 68, at 98.

71. *Id.* at 99. Genetic counselors provide counseling and information to patients seeking genetic testing. See National Society of Genetic Counselors, *About NSGC*, at <http://www.nsgc.org/about/index.asp> (last visited July 12, 2003); *see also* Silvers & Stein, *supra* note 68, at 1349-50.

and potential risks of genetic testing, concerns about genetic privacy do exist, whether they are scientifically justified or not.

Perhaps the most important lesson from *Minority Report* and *Gattaca* relates to the limits of predetermination. In both films, the predictive systems fail.⁷² To succeed, the protagonists must rely not on the governing science of the day but, rather, on themselves.⁷³ Paradoxically, the films stand for two opposing propositions: first, strongly predictive science can be valuable to society, and second, individuals have the power to overcome their “destinies.”

IV. THE CASPI APPROACH: AN ALTERNATIVE TO GENETIC DETERMINISM

While the judiciary has generally rejected the extreme conclusions of genetic determinism,⁷⁴ it cannot be denied that the genetic age is here. It would be reckless to ignore all genetic information simply because it is not determinative in isolation. Judges and policy makers should develop a comprehensive model which considers all three influencing factors (genetics, environment, and free will), but also recognizes the risks of genetic discrimination and stigma present in our society. This Note will use the Caspi Study as a vehicle to develop such a model.

A. Study Procedures

Caspi and his co-authors examined data from the Dunedin Multidisciplinary Health and Development Study which included over 1,000 New Zealand children who were assessed every two years between the ages of three and fifteen and again at ages eighteen and twenty-six.⁷⁵ The study coordinators hypothesized that the MAOA high genotype could moderate the impact of early abuse or neglect.⁷⁶ They believed that abused boys who had the MAOA low genotype would be more prone to violence, while abused boys who had the MAOA high genotype would be less prone to violence.⁷⁷

72. MINORITY REPORT, *supra* note 1; GATTACA, *supra* note 32.

73. MINORITY REPORT, *supra* note 1; GATTACA, *supra* note 32.

74. See Johnson, *supra* note 14, at 462 (discussing the implications if the American criminal justice system were to adopt the genetic determinism perspective); Evansburg, *supra* note 14, at 1566-67 (arguing for changes to the Federal Sentencing Guidelines to allow for a genetic impairment).

75. Caspi et al., *supra* note 6, at 852.

76. *Id.*

77. *Id.* at 851-52. The study examined four measures of antisocial conduct including diagnosis of Conduct Disorder, according to criteria from the Diagnostic and Statistical Manual

Though not the first time that genetic science has attempted to identify biological markers or genotypes for violent or criminal behavior,⁷⁸ the Caspi Study goes one step beyond previous efforts by incorporating the effects of environment into the predictive equation.⁷⁹ This multidimensional approach has stronger intuitive appeal since behavior is a multidimensional concept.⁸⁰

B. Study Results

The results of the Caspi Study supported its general hypothesis in several respects.⁸¹ First, “although individuals having the combination of low-activity MAOA genotype and maltreatment were only 12% of the male birth cohort, they accounted for 44% of the cohort’s violent convictions. . . . Moreover, 85% of [this group] developed some form of antisocial behavior.”⁸² Second, for each of the four measures of anti-social behavior (conduct disorder, violent criminal conviction, self-report, and antisocial personality disorder), maltreatment only led to increased antisocial behavior in the low MAOA group.⁸³ In other words, while boys with the MAOA high genotype sometimes grew up to engage in antisocial conduct, a history of maltreatment did not lead to a statistically significant increase in their chances of doing so.⁸⁴

of Mental Disorders (DSM-IV); convictions for violent crimes; personality disposition toward violence; symptoms of Anti-Social Personality Disorder. *Id.* at 852.

78. MAOA has been previously implicated in violent behavior through both human and animal research. *See* Caspi et al., *supra* note 6, at 851. A rare genetic mutation leading to the total lack of production of MAOA was identified in men from one Dutch family, several of whom were known for bouts of aggressive behavior. *Id.*; Evansburg, *supra* note 14, at 1571-72. Similarly, studies in lab mice found that deleting their MAOA gene resulted in more aggressive behavior. Caspi et al., *supra* note 6, at 851. A series of studies in the 1960s purported to establish a link between the XYY condition, where a male was born with an extra Y chromosome, and criminal behavior. Johnson, *supra* note 14, at 460-61; The Online Ethics Center for Engineering and Science at Case Western University, *Case Study #4: The XYZ Controversy*, at <http://onlineethics.org/edu/precol/classroom/cs5.html> (last modified Nov. 12, 1999). Subsequent research refuted these findings but not before the concept had entered common vernacular as the “criminal chromosome.” *Id.*

79. *See* Caspi et al., *supra* note 6, at 851.

80. *See supra* Part II.B.

81. *See* Caspi et al., *supra* note 6, at 851-53.

82. *Id.* at 853.

83. *Id.*

84. *Id.*

C. Predictive Limitations

While the Caspi Study's results are promising, one must also recognize what they do not reveal. Assuming its validity, the Study shows that, on average, eighty-five percent of boys who are severely maltreated *and* who have the MAOA low genotype will engage in some form of antisocial conduct.⁸⁵ Further, approximately twenty to forty percent of severely abused, MAOA high boys will also engage in antisocial behavior.⁸⁶ These results can therefore be grouped into four categories of severely maltreated boys:

Table 1:

	Antisocial Behavior	No Antisocial Behavior
MAOA low	True Positives (Possess the genetic risk factor and have antisocial behavior)	False Positives (Possess the genetic risk factor but do not have antisocial behavior)
MAOA high	False Negatives (Lack the genetic risk factor but do have antisocial behavior)	True Negative (Lack the genetic risk factor and do not have antisocial behavior)

The Caspi data shows that these two factors (MAOA type and severe maltreatment) will correctly identify "true positives" about 50% of the time and "true negatives" about 90% of the time.⁸⁷ Therefore,

85. *Id.*

86. *Id.* at 852 fig. 2. Twenty to forty percent is used as a proxy for the actual percent of severely maltreated, MAOA high boys who later engaged in antisocial conduct. A more specific number was not available as of this writing. E-mail from Terrie Moffitt, Professor, Medical Research Council Social, Genetic, and Developmental Psychiatry Research Centre, Institute of Psychiatry, King's College, London, to Robert Stone, (Feb. 17, 2003, 10:02:46 CST) (on file with author).

87. A test's ability to determine true positives (Sensitivity) is calculated by the following formula: True Positives / (True Positives + False Negatives). E-Mail from Ellen Wright Clayton, M.D., J.D., Vanderbilt University Rosalind E. Franklin Professor and Director, Center for Genetics and Health Policy, Professor of Pediatrics, Professor of Law, to Robert Stone (Feb. 14, 2003, 08:39 CST) (on file with author). A test's ability to determine true negatives (Specificity) is calculated as follows: True Negatives / (False Positives + True Negatives). *Id.*

predictions based only on the interaction between MAOA type and abuse history will be both over- and under-inclusive. Some boys will *never* exhibit antisocial behavior even though they are categorized as at-risk, while others *will* exhibit antisocial behavior but have neither the genetic nor the environmental predisposition to such behavior.

Clearly, MAOA type and abuse history are not the exclusive factors involved in determining these boys' future behavior; free will and other yet to be identified genetic and environmental factors must also be considered.

To explore the pragmatic significance of these results, assume that a hypothetical juvenile court is presented with two boys who have been the victims of equally severe abuse. One has tested MAOA low and the other MAOA high. Since these two factors alone do not capture everything involved, we can make only incomplete predictions about these two *individual* boys. Caspi's statistical conclusions only apply directly to populations—not to individuals.

The Caspi Study's shortcomings do not mean that it has no value, but rather, only that it should not be relied upon as the determinative factor in individual cases. When making decisions about a child, the State's child welfare system never has perfect information; it already engages in educated guessing, not scientific prediction. This Note proposes that genetic components, such as the genotype presented in the Caspi Study, should be included as a part of the larger calculus, not as an overriding predictor.⁸⁸ Such an approach would appropriately consider genetic predispositions without falling into the trap of genetic determinism.

The Caspi Study presents an intriguing finding that is replete with risk and promise. If validated, it could have far-reaching implications for the operations of child welfare departments and dependency courts as well as for efforts to prevent violent crimes. It also provides an opportunity to prepare appropriate responses to complicated ethical issues before they are fully realized.

V. SHOULD TESTING FOR THE "CASPI PREDISPOSITION" BE ALLOWED AT ALL—A THRESHOLD QUESTION

Before discussing the dilemmas that testing for the Caspi predisposition may generate, this Note will address a threshold question—should testing for this predisposition be allowed at all?

88. Specific recommendations regarding how this information should and should not be used are discussed at length below. See *infra* Part VI.B.

The Secretary's Advisory Committee on Genetic Testing ("SACGT" or "the Committee") was chartered in 1998 "to advise the Department of Health and Human Services on the medical, scientific, ethical, legal, and social issues raised by the development and use of genetic tests and, if warranted . . . to recommend options for additional oversight."⁸⁹ The Committee identified the following criteria to use in assessing the benefits and risks of genetic tests: analytical validity, clinical validity, clinical utility, and social consequences.⁹⁰

While not perfectly attuned to a combined gene-environment predisposition, these criteria offer one framework for weighing the benefits and risks of allowing States to test abused children for the Caspi predisposition.

A. Analytical Validity

Analytical validity refers to a test's basic accuracy and reliability in measuring what it claims to measure.⁹¹ If a test is not analytically valid, it should be rejected as inaccurate from the outset.⁹² In the context of the Caspi predisposition, a test for analytical validity must identify both the relevant gene (MAOA low or high) and the type of maltreatment necessary to trigger the predisposition.⁹³

The Caspi Study purported to use analytically valid techniques to genotype the boys involved.⁹⁴ The MAOA gene has been studied for many years, and there is every reason to believe the researchers used acceptable scientific techniques to identify the genotype of their subjects.⁹⁵

However, the study did not attempt to parse the maltreatment element beyond broad categories of none, probable and severe.⁹⁶ A test for the environmental aspect of the predisposition would need

89. NAT'L INSTS. OF HEALTH SEC.'S ADVISORY COMM. ON GENETIC TESTING, ENHANCING THE OVERSIGHT OF GENETIC TESTS: RECOMMENDATIONS OF THE SACGT vi. (July 2000), available at <http://www4.od.nih.gov/oba/sacgt/gtdocuments.html> [hereinafter ENHANCING THE OVERSIGHT OF GENETIC TESTS].

90. *Id.* at 15-20.

91. *Id.* at 15.

92. NAT'L INSTS. OF HEALTH SEC.'S ADVISORY COMM. ON GENETIC TESTING, DEVELOPMENT OF A CLASSIFICATION METHODOLOGY FOR GENETIC TESTS: CONCLUSIONS AND RECOMMENDATIONS OF THE SECRETARY'S ADVISORY COMMITTEE ON GENETIC TESTING 4 (2001), available at <http://www4.od.nih.gov/oba/-sacgt/gtdocuments.html>.

93. See ENHANCING THE OVERSIGHT OF GENETIC TESTS, *supra* note 89, at 15 n.10.

94. Caspi et al., *supra* note 6, at 852.

95. See J.C. Shih & R.F. Thompson, *Monoamine Oxidase in Neuropsychiatry and Behavior*, 65 AM. J. HUM. GENETICS 593, 593 (1999).

96. Caspi et al., *supra* note 6, at 852.

additional research and development before its analytical validity could be assessed.

B. Clinical Validity

Clinical validity is similar to analytical validity, but to be clinically valid, a test must accurately detect the presence or absence of a clinical condition which is, in this case, a behavioral predisposition to violence.⁹⁷ While an analytically valid test would accurately identify which genotype a child had, a clinically valid test would also predict that, if exposed to certain childhood abuse, that child was predisposed to antisocial behavior.

Determining the clinical validity of a test for a gene-environment interaction is significantly more complicated than for a strictly genetic predisposition. A hypothetical "Caspi Test" seeking government approval would not fit the pattern of other drug or test approval situations. To determine the clinical validity of a gene-environment interaction, one must develop a test that identifies the correct gene (which is all that is necessary to determine the clinical validity of a strictly genetic predisposition) as well as a test that identifies the relevant environmental factors. To determine if a test for a "Caspi predisposition" is clinically valid, the extent and type of abuse that gives rise to the predisposition must be scientifically defined. One must answer questions such as: How much abuse is required for the predisposition to be activated? What types of abuse (physical, emotional, sexual) activate the predisposition? Is neglect or exposure to domestic violence or drug abuse sufficient? How young must the child be when abused? Until an abuse assessment is developed that specifically identifies the environmental aspect of the predisposition, verification of abuse by a child welfare department would have to serve as a proxy. This appears to be the approach followed by the Caspi study.

The fact that the Caspi predisposition leads to a *behavioral* disorder, not a medical or physical disorder, adds to the difficulty in assessing clinical validity. If an individual's free will acts as a confounding variable, a genetic behavioral predisposition could be present but violent behavior could be avoided if the individual chose to avoid it. This combination of variables would make it extremely difficult to assess the clinical validity of any test that seeks to identify the Caspi predisposition to violence.

97. See ENHANCING THE OVERSIGHT OF GENETIC TESTS, *supra* note 89, at 16-17.

C. Clinical Utility

The Committee describes clinical utility as “tak[ing] into account the impact and usefulness of the test results to the individual, the family, and society. The benefits and risks to be considered include the psychological, social, and economic consequences of testing as well as the implications for health outcomes.”⁹⁸

The Committee’s discussion of clinical utility does not translate easily into an involuntary testing situation. Its report emphasizes that “only individuals can weigh the balance between negatives and positives once a test is deemed safe and efficacious and that not everyone will make the same choice.”⁹⁹ This conclusion is consistent with research that many adults who know they are at-risk for genetic disorders choose not to be tested due to their personal determination that the risks of testing outweigh the benefits.¹⁰⁰ Choosing to forego testing is particularly likely when there is a test for a genetic predisposition to an illness that has no treatment available.¹⁰¹

Clinical utility is therefore extremely difficult to determine when the individual being tested is an abused child. Normally the parents would serve as surrogate decision makers for the child, but when they are under investigation for child abuse their motivations are inherently suspect. If clinical utility involves only a personal balancing of the risks and benefits of testing, then it cannot be included in an analysis of a test for the Caspi predisposition.

However, instead of completely rejecting clinical utility when analyzing a “Caspi test,” a hypothetical regulating body should instead consider a test’s potential utility to society as a whole, balanced against the likely risks to the individual and his family. If a test has been shown to be highly predictive of antisocial behavior and there is effective, preventative treatment available, then decision makers should judge it as having high clinical utility. At the other extreme, if a test was only shown to be moderately predictive and

98. *Id.* at 17-18. Factors relevant to Clinical Utility include 1) the purpose of the test, 2) the quality of evidence for assessing outcomes, 3) the potential benefits and risks of test results, 4) the nature of the health condition, 5) uncertainties of genetic test results, and 6) implications for the family. *Id.*

99. *Id.* at 16.

100. See AMERICAN MEDICAL ASSOCIATION, REPORT 66: TESTING CHILDREN FOR GENETIC STATUS (June 1995), at <http://www.ama-assn.org/ama/pub/category/5494.html> [hereinafter AMA REPORT], at 1 (“[I]ndividuals may not want their condition determined. Some people may simply prefer not to know that they are likely to develop a devastating disease, such as Huntington’s disease, for which no preventive or ameliorative therapies exist.”).

101. See ENHANCING THE OVERSIGHT OF GENETIC TESTS, *supra* note 89, at 16.

there was no treatment available, then it should not be considered as clinically useful.

While, in theory, the Committee's definition of clinical utility already incorporates social utility, in practice the definition defers almost exclusively to the individual's judgment. While a test for the Caspi predisposition could not allow the same deference to the individual, the test may nevertheless have a level of usefulness to society that would make it worthwhile.

D. Social Consequences

Testing for behavioral predispositions arising from gene-environment interactions may have significant, negative social consequences for the individual tested, including discrimination and stigmatization.¹⁰² In addition, these tests could create the possibility of renewed eugenics programs or ethnically based discrimination.¹⁰³ Tests for mental illnesses and dementia have been identified as particularly vulnerable to these negative social consequences.¹⁰⁴

It is easy to imagine dangerous outcomes for a child whose genetic predisposition is disclosed. Even well-meaning teachers or caregivers may begin to treat the child differently, perhaps over reacting to age-appropriate signs of aggression or failing to set appropriate limits out of a fear that the child will become angry more easily than his peers.¹⁰⁵ Scenarios like this could "affect self-perception and could have a profound impact on life decisions."¹⁰⁶

Alternatively, testing could result in very positive overall consequences for society at large. If early identification and treatment of individuals predisposed to violence would result in decreased crime, victimization, and incarceration, the psychological risks to the individuals being tested might be justified from a public policy standpoint. Perhaps the "Pre-crime" police units from *Minority Report* are not as offensive or far-fetched as they originally sounded.

E. Conclusion on the Threshold Question

An analysis of the risks and benefits attendant in this sort of combined gene-environment testing does raise multiple red flags.

102. See *supra* Part III.B.1.

103. See ENHANCING THE OVERSIGHT OF GENETIC TESTS, *supra* note 89, at 20.

104. *Id.*

105. See Nelkin & Tancredi, *supra* note 51, at 69-70 (discussing a variety of results in the classroom from using genetic tests to label children).

106. See ENHANCING THE OVERSIGHT OF GENETIC TESTS, *supra* note 89, at 20.

After overcoming the issue of analytical validity,¹⁰⁷ serious problems remain with determining a test's clinical validity, clinical utility, and ultimate social consequences in the context of predicting violent behavior. Accurately identifying a Caspi predisposition will require testing for MAOA type as well as careful assessment of the child's personal history. Further research will have to be conducted to determine the exact contours of the maltreatment that triggers the predisposition. Caspi relied on rough categories of "no maltreatment," "probable maltreatment," and "serious maltreatment."¹⁰⁸ More discerning definitions must be developed.

While recognizing that gene-environment predispositions pose complex challenges, it is this very complexity that makes a compelling case for allowing further testing and research. As discussed earlier, only a comprehensive approach, incorporating biology and environment, nature and nurture, is ever likely to offer accurate prediction of antisocial behavior. Even though the risks are great, the potential benefits may be even greater. Additional research should be conducted and, after proper validation, the government should allow tests for the Caspi predisposition to be marketed and used.

Assuming this recommendation is followed and clinically comprehensive, analytically valid tests are developed, their most likely application will be in State child abuse investigations.

VI. HYPOTHETICAL CASE STUDY

A. Issues for Physicians Involved in Abuse Investigation

Suppose that, as part of an active child abuse or neglect investigation, a State child welfare system refers a boy to a physician for a physical examination to determine whether the child has been abused and, if so, the extent of the abuse. If the physician finds signs of abuse, the State would require her to gather physical and medical evidence to support a decision regarding the child's disposition and potential prosecution of the abuser.

Attempting to accumulate this evidence, the doctor may test to determine the child's MAOA genotype. The genetic information, coupled with the history of abuse, could assist in predicting antisocial behavior. In deciding whether or not to conduct this test, the physician must consider several issues and competing interests.

107. This has presumably already been done, since the Caspi study relies on genetic testing to identify and categorize its participants. See Caspi et al., *supra* note 6, at 852.

108. *Id.*

Though the child's best interest must be the overriding concern, this becomes difficult to assess when the physician acts as both a clinician and an abuse investigator. Further, the interests of the child, the accused parent, and the State may conflict. The presence of a predisposition for violence could influence the State's decision regarding the child's disposition. There may be confusion regarding which party possesses the legal authority to provide informed consent for the test. In fact, the parents may actively oppose the testing since it could reveal their own genetic information. Once genetic information is revealed, it cannot be unlearned. Therefore, the testing is also a serious abrogation of a child's future right to refuse testing. Finally, in determining whether or not to test for the MAOA genotype, the physician may consider whether or not treatment options for this predisposition to violence exist.¹⁰⁹ For the physician, the availability of treatment makes genetic testing more valuable. This issue highlights the potentially conflicting motivations of the physician and the State, with the former focusing more on the child's best interests and the latter focusing more on the social value of identifying children at-risk for future violence.

If the physician decides to conduct the test and the results indicate the presence of a genetic predisposition to violence, she must determine how aggressively she should provide prophylactic treatment. This is especially difficult if the only treatment options are unproven or speculative. Further complicating the situation is the fact that medical and behavioral disorders, which are both involved in this case, may require very different treatment protocols.

B. Issues for the State Child Welfare Department

After the physician has submitted her report to the State, including the child's genetic information, the child welfare department must determine how to use the information. This decision presents more legal issues than the physician's decision, since the State's administrative and judicial bodies exert *direct* control over this process while exerting only *indirect* control over physicians in clinical settings.

Upon determining that a child has been abused or neglected, the State must first decide whether or not to remove the child from his

109. It is commonplace for genetic tests to be developed long before effective treatments are available. See, e.g., Huntington's Disease Society of America, *Ask the Doctor*, at <http://www.hdsa.org/edu/AskADoctor.pl?show=10> (last visited July 5, 2003) (describing Huntington's Disease as one of the more common genetic disorders, which has had a test available since 1993, but for which no effective treatment or cure currently exists).

parents' custody.¹¹⁰ Child welfare departments commonly utilize a variety of factors when assessing the level of risk to a child in an abuse investigation.¹¹¹ Should the presence of a genetic predisposition lower the bar for removing the child from the parents' custody? To reframe the issue, is it more harmful for a parent to abuse a child who has this genotype, whether the parent knows it or not? Or, are the behavioral and societal consequences of abusing a child with the MAOA low genotype too attenuated and unclear to be considered? Is it appropriate to treat two children differently due to their genetic predisposition even though they have suffered the same degree of abuse?

With which third parties should the State share the results of the genetic test? What are the benefits and risks associated with disclosure to foster parents, family members with whom the child has been placed, or school officials?

As this hypothetical demonstrates, the identification of a valid gene-environment predisposition creates a morass of legal, ethical, and policy issues, especially when the information is gained, as it likely would be, in the course of an adversarial proceeding. This child has not yet exhibited and may never exhibit any antisocial conduct. While the first and foremost concern should be the best interests of the child, it is not at all clear what courses of action lead to that outcome. Since the gene-environment interaction may be predictive of violence, the involved professionals must also act to protect potential victims and society at large.

VII. RECOMMENDATIONS

A. Physician Self-Regulation Through Ethical Guidelines

1. Decision to Test

The American Medical Association (AMA) published a report entitled "Testing Children for Genetic Status," and its accompanying

110. See Kathleen S. Bean, *Changing the Rules: Public Access to Dependency Court*, 79 DENV. U. L. REV. 1, 43 (2001).

111. See, e.g., STATE OF TENNESSEE, DEP'T OF CHILDREN'S SERVS., CHILD PROTECTIVE SERVICES RISK ASSESSMENT, ch. 14.1, at 1-3 (2002) available at <http://www.state.tn.us/youth/policies> (listing risk factors such as severity/frequency of abuse; history of abuse; child's age and developmental status; child's presenting behavior; child's attachment with caretaker; child's community visibility; peer/sibling interaction; caretaker's history, knowledge, and emotional health; environmental conditions; and family support).

ethical guideline, "E-2.138 Genetic Testing of Children."¹¹² These documents describe the circumstances where, according to the AMA, physicians 1) should genetically test children and 2) should refuse to conduct genetic testing even if the child's parents request it.¹¹³

The AMA recommends balancing the benefits and disadvantages to the involved child. It considers the abrogation of the child's future choice in knowing his genetic status as the most serious concern with mandated genetic testing.¹¹⁴ Many adults who are presented with the option choose not to be genetically tested.¹¹⁵ Testing a child takes that choice away.¹¹⁶ However, if the benefits of testing clearly outweigh the risks, as with testing for conditions with effective treatments, testing should be offered and even sometimes required.¹¹⁷

While the AMA's recommendations are particularly well-suited to a more traditional, genetic predisposition to a medical disorder, they break down when faced with the Caspi predisposition, a gene-environment predisposition for a behavioral disorder. Given the broader public interest in preventing violence, focusing exclusively on the child's best interests may not be adequate. Testing in the context of a child abuse investigation may complicate the physician's role since she becomes, in some respects, an agent of the State, partially obligated to act on public policy grounds rather than simply the best interests of the child.

Ultimately, the AMA report is an excellent starting place. However, given the physician's potential conflicts of interest¹¹⁸ the court should appoint a Guardian ad Litem ("GAL") to serve as the child's advocate.¹¹⁹ While the parents would normally assume this role, abuse allegations would disqualify them. Obtaining the

112. See AM. MED. ASS'N, E-2.138 GENETIC TESTING OF CHILDREN, at <http://www.ama-assn.org/ama/pub/article/4301-4411.html#G> (June 1996) [hereinafter AMA OPINION]; AMA REPORT, *supra* note 100.

113. See AMA OPINION, *supra* note 112; AMA REPORT, *supra* note 100.

114. See AMA OPINION, *supra* note 112; AMA REPORT, *supra* note 100, at 1-2.

115. See AMA REPORT, *supra* note 100, at 1 ("Individuals may not want their condition determined. Some people may simply prefer not to know that they are likely to develop a devastating disease, such as Huntington's disease, for which no preventive or ameliorative therapies exist.")

116. See AMA OPINION, *supra* note 112; AMA REPORT, *supra* note 100, at 1-2.

117. See AMA REPORT, *supra* note 100, at 3.

118. These conflicts include: (1) the physician as both medical professional and abuse investigator and (2) the public's interest in preventing violence as opposed to the child's interest in not having his medical/genetic privacy disturbed.

119. See generally National Court Appointed Special Advocates, at <http://www.nationalcasa.org> (last visited July 12, 2003) (CASA is a national organization that trains and coordinates volunteers who advocate for children in abuse and delinquency courts.).

concurrence of a duly informed GAL in the decision to test could alleviate some of the concern that the child's interests are not represented.¹²⁰ If the child welfare department, the GAL, and the physician could not reach a consensus as to whether or not the child should be tested, the physician should conduct a test only if ordered to do so by the courts, which would be in the most objective position to weigh the competing interests involved.¹²¹

One potential criticism of this approach relates to the amount of time it might take to obtain a court order. Ideally, abuse investigations proceed quickly so that medical evidence does not degrade. However, there is no similar concern with genetic testing since the child's genotype will not change. Time is simply not a concern for genetic testing. The initial abuse investigation can proceed quickly while the decision of whether or not to conduct a genetic test is deliberated.

2. Refusal to Test

The AMA report strongly recommends that a physician refuse to genetically test a child for a condition that lacks any effective treatment or prevention regimen, even if the parents request the test.¹²² If the physician believes that the parents are pursuing their own interests over the child's, the physician may choose to resort to the legal system to protect the child.¹²³

Similarly, the State might pressure the physician to proceed with testing, even if no treatment options are available, for purposes of research or to allow for monitoring of predisposed children for antisocial conduct. Where the State's interests conflict with the child's interests a physician faces a significant ethical dilemma and should seek consultation and possibly legal counsel. If applicable law clearly supported the State in requiring a genetic test, the physician would have to decide whether or not to make an ethical stand and refuse to conduct an otherwise lawful test that she believes would harm her patient.¹²⁴ Though the State has a right to balance public and private interests through its regulatory powers, a physician has the ethical

120. See *infra* Part VII.B.2.

121. Alternatively, if parental consent could be obtained, then no order would be necessary. This is an unlikely option considering the circumstances.

122. *Id.* at 2.

123. *Id.* at 2-4.

124. While no current laws, cases, or regulations require physicians to conduct genetic testing in child abuse evaluations, the identification of Caspi-type predispositions could eventually lead States to pass such laws.

responsibility to advocate for her patients and values.¹²⁵ While the State may ultimately win such a conflict, the physician should have the right not to participate if it violates her ethical principles.

3. Treatment Issues

If preventative medical treatment is available, the physician should do everything in her power to obtain that treatment for the child. At the point in an abuse investigation where treatment is prescribed, the State would likely have the capacity to provide consent since the child would likely be under its supervision. If the parents have regained or retained legal guardianship and they refuse to cooperate with treatment recommendations, there is little the physician can do except counsel the parents regarding the benefits of treatment for their child.

Before effective preventative treatments are identified and thoroughly researched, physicians might be prone to "off-label" prescription.¹²⁶ They might prescribe medications that were designed for individuals who have already exhibited antisocial conduct, not for children with predispositions, in the hope of preventing the child from developing harmful behavior. While off-label prescribing is a completely legal and common practice, it is not appropriate in this situation. Since development of anti-social conduct is never guaranteed, the potential side effects to the individual would not be worth the potential benefits to society. Rather than prescribing off-label medications that are unproven in this context, physicians should refer predisposed patients for preventative mental health counseling. Counseling has far fewer potential side effects but could still minimize the effects of childhood trauma.

While development of ethical guidelines for physicians would provide some protection for children subject to testing, stronger regulations would be necessary. Ethical restrictions only address one piece of a much broader issue. Once a predisposition is identified a host of other legal and policy questions arise, which are completely out of the hands of medical professionals. Given the complex and difficult value judgments involved with the Caspi predisposition, only policy

125. See AM. MED. ASS'N, E-10.015 THE PATIENT-PHYSICIAN RELATIONSHIP, at <http://www.ama-assn.org/ama/pub/article/4301-4412.html#P> (June 2001).

126. Off-label testing is "where a test approved by the FDA for one purpose is used for another." See Michael J. Malinowski & Robin J.R. Blatt, *Commercialization of Genetic Testing Services*, 71 TUL. L. REV. 1211, 1230 n.64 (1997) (discussing the common practice of off-label use of genetic tests).

making bodies would be appropriate to weigh the interests of involved individuals versus those of society.

B. Regulations Within the Child Welfare System

The child welfare system is the easiest and most appropriate point to intervene in the oversight and regulation of these tests because judicial and administrative bodies exert direct control over it. As a result, policies set by State child welfare departments are likely to determine the extent to which the risks from such testing are minimized and the benefits realized.¹²⁷

1. Limiting When and How to Conduct the Test

a. Only As Part of an Active Abuse Investigation

A test for the Caspi predisposition should be requested and performed only within the scope of an active abuse investigation. Given the risks of conducting genetic tests,¹²⁸ the offsetting benefits are insufficient to justify the test unless the child is believed to be a victim of abuse. It is conceivable that a child welfare department would want to obtain tests on every child that enters their system, no matter the route or history that brings them in. This “population testing” raised serious concerns among the SACGT.¹²⁹ Under the Committee’s approach, screening tests would be subject to heightened regulatory scrutiny.¹³⁰ While a child welfare department may have lofty goals of identifying genetically at-risk children, the immediate risks associated with revealing such information are only outweighed when the specifically relevant environmental factors have been verified. For example, it would be inappropriate to genetically test

127. While a Federal legislative approach is appealing in its uniformity and central control, states have historically had authority over family law and child welfare issues. *Egelhoff v. Egelhoff*, 532 U.S. 141, 151 (2001) (“There is indeed a presumption against pre-emption in areas of traditional state regulation such as family law.”) The maintenance of such a State-based approach would allow states either to completely prohibit such childhood testing, thereby expressing a State policy that the child’s interests completely trump the public’s interest in identifying “at-risk” populations, or allow for more lenient testing, expressing a stronger interest in preventing violence. This Note advocates that if coerced childhood testing is allowed, it must always be under strong administrative policies and/or State law restrictions that protect the child’s interests.

128. *See supra* Part III.B.

129. *See* ENHANCING THE OVERSIGHT OF GENETIC TESTS, *supra* note 89, at 18.

130. *Id.* at 21-22.

children who were abandoned by their parents but had no other history of maltreatment or to test children that the State was monitoring for suspected but unproven abuse. Similarly, children who are removed solely due to their parents' drug use or incarceration should not be tested, unless these experiences are proven to lead to the predisposition.¹³¹ Additional research must identify types of maltreatment that could trigger State involvement but do not trigger a genetic predisposition to violence. These types of maltreatment could conceivably include indirect exposure to domestic violence or living in unsanitary conditions. In short, since genetic testing has inherent social and psychological risks, the State should confine the situations where a child would be tested to those that have been scientifically shown to trigger a predisposition to violence in children with the genotype.

b. Only Under Physician Supervision

Considering the significance and sensitivity of the conclusions being drawn from genetic information, another logical limitation would be to require that all testing be conducted in a physician's office or by an approved clinical lab with physician approval. Ideally, State law would further require that only those physicians experienced in assessing child maltreatment be allowed to conduct the testing. Requiring physician approval should ensure the use of proper testing procedures, which would maintain the integrity and accuracy of the testing, as well as patient confidentiality.¹³² Medical protocols advise the professional on how to decide *not* to conduct a genetic test even in the face of external systemic pressure, as might come from a child welfare department.¹³³ Requiring physician involvement injects a professional into the process who is duty bound to comply with legal and ethical norms.

As technology progresses, one foreseeable but less appealing alternative to requiring that physicians conduct the testing would be to allow child welfare departments to do it, under their own guidelines. This approach would de-medicalize this type of genetic

131. This conclusion assumes that such experiences have not been shown to trigger the genetic pre-disposition.

132. See Silvers & Stein, *supra* note 68, at 1348 ("Detection within a medical setting may confer the indirect benefits of clinical quality controls, genetic counseling, and physician fiduciary obligations.").

133. See *supra* Part VII.A.2.

testing to the detriment of the individual being tested.¹³⁴ While genetic information may or may not differ from traditional medical information, everyone agrees it should receive at least the same level of privacy and protection as does the general medical information.¹³⁵

Requiring, as a matter of State law, that a physician conduct all genetic testing completed as part of an abuse investigation would minimize the risk of an over-zealous child welfare employee conducting tests without appropriate consideration or safeguards.

2. Require Assignment of a Guardian ad Litem

Guardians ad Litem (GALs) are often assigned in dependency and delinquency cases to advocate for the child's best interests.¹³⁶ The need for GALs in cases involving genetic testing of abused children is even more compelling than in the typical abuse case. Since the State child welfare department will be balancing the State's interests in preventing future violence as well as the child's interests in having a safe environment, its position as advocate for the child is compromised. Only a neutral third party, whose sole concern is safeguarding the child's interests, can be systematically trusted to voice concerns about possible discrimination and abrogation of the child's future rights not to have genetic information revealed.

3. Provide Genetic Counseling

The State should require that genetic counseling and education be offered to every child tested as part of an abuse investigation, as well as to his family. As this Note demonstrates, genetic predispositions are incredibly complicated, especially when they involve behavioral disorders. A genetic counselor could explain what it means and does not mean to have the Caspi predisposition. The counselor could educate the parents about common problems arising in families that have been tested, including changes in attitudes toward or treatment of the abused child. The family's concerns and questions could be answered before inaccurate beliefs developed. Furthermore, in the case where one parent or adult in the house has

134. In the film *Gattaca*, a woman is seen kissing her date and quickly going to a screening booth to get her lips swabbed by a technician. *GATTACA*, *supra* note 32. Almost instantly, she has a printout of all of his genetic information and predispositions. *Id.*

135. See Suter, *supra* note 43, at 671 (advocating for stronger protection of all medical information, not just genetic information).

136. Bridget Kearns, Comment, *A Warm Heart but a Cool Head: Why a Dual Guardian ad Litem System Best Protects Families Involved in Abused and Neglected Proceedings*, 2002 WIS. L. REV. 699, 708-13 (2002) (discussing the history and role of Guardians ad Litem).

been abusive and the other has not, it may be beneficial for the nonabusive parent to understand all the possible consequences of the abuse, including predispositions that it may have caused. An understanding of genetic information may help motivate a parent to keep her child in preventative treatment even if the child is not exhibiting any symptoms.

However, providing such services could be logistically problematic, since counseling requires voluntary participation and the testing is likely to be involuntary. Nevertheless, if counseling services are accepted, they could avoid future conflicts, such as the parents seeking an injunction against testing.

4. Use of the Information in Disposition Decisions

After verifying that a child was abused, the child welfare department must decide whether or not to 1) maintain the abused child in the home through the provision of in-home services, 2) remove the child from the home, and/or 3) seek permanent termination of parental rights. Assuming that a test for the Caspi predisposition is conducted, it is still unclear how the State should use the results in the disposition of the child.

This Note proposes the application of two related principles in making disposition decisions. Both of these principles are driven by the predictive limits of the Caspi results and the statistical reality that such results only speak directly about *groups* of abused children and not about *individuals*. First, we must act under the presumption that no child will be violent. This is known as an "Equality Approach." Second, the genetic information should only be used to better interpret and understand past events in the child's life and not to predict the child's future behavior.

a. An Equality Approach

Silvers and Stein proposed a reconceptualization of individuals seeking protection from genetic discrimination.¹³⁷ Courts should presume "that members of the class of genetically anomalous people will remain competent and productive, although a sub-class will not be so, rather than that class membership means future deficiency."¹³⁸ The Silvers and Stein approach is equality based and borrows from the civil rights classifications for race and sex.¹³⁹ The approach seeks

137. Silvers & Stein, *supra* note 68, at 1344-45.

138. *Id.* at 1392.

139. *Id.* at 1393.

to prohibit the use of genetic information to stereotype individuals, shifting the burden away from the individual having to prove he is capable and instead placing it on the party seeking to prove he is deficient.¹⁴⁰ This position aligns with the thesis of this Note: although combining genetic and environmental factors can have great social utility, the ever present existence of free will confounds their predictive value in individual cases. Individuals must be given the opportunity to overcome their genetic predispositions. “[T]he law has little patience with legal classifications construed in probabilistic terms.”¹⁴¹

The Silvers and Stein paradigm is best demonstrated through the example of a discriminating employer. Under this view, an employer might use genetic information to stereotype, concluding from an employee’s membership in a particular class that his future behavior will be problematic or aggressive. Firing or refusing to hire someone based on genetic stereotyping would be prohibited under the equality approach, without additional current evidence, such as incidents of aggression or legal violations. Only with evidence of aggression or past violent acts could the employer meet his burden of proving that a particular individual, not a class of individuals, is incapable of performing his employment duties.

Using parallel reasoning, the child welfare department should not be allowed to reroute limited resources or services away from predisposed children, believing them to be lost causes. The presence of a certain behavioral predisposition, no matter how generally predictive it is in a population, cannot be used to discriminate against an individual who may never manifest symptoms of that predisposition.¹⁴²

b. Understanding the Past, Not Predicting the Future

In contrast, the State should be allowed to use the presence of an MAOA low test result in making general disposition and case planning decisions. While these conclusions appear inconsistent, they both follow the general principles laid out above.

Child welfare departments, unlike employers, should be allowed to consider factors that ameliorate or exacerbate the effects of abuse on a child. Child welfare departments consider many other factors, such as age and developmental status in determining what

140. *Id.* at 1392.

141. *Id.* at 1393.

142. This is assuming that no such behavioral predispositions will ever reach 100% predictability.

impact abuse has had on a child and, subsequently, what steps the State should take in response.¹⁴³ In effect, a child's genetic predisposition should be allowed to lower the bar for removal or for closer State supervision. The State should be allowed to treat differently two abused children who are otherwise similarly situated, based on their genetic make-up. As groups, the effects of abuse on MAOA low children are more serious than on MAOA high children.¹⁴⁴ The alternative position, consciously ignoring this genetic difference, in order to promote total equality of treatment, would be comparable to ignoring the differences between an abused three-year-old and an abused fifteen-year-old in the name of avoiding age discrimination. The State must consider all relevant factors in determining its response.

The approach proposed here would allow genetic predispositions to improve our understanding of past events, but not to predict future behavior. This approach is similar to the distinction between genetic testing for diagnostic purposes, to confirm the existence of a disease after symptoms have manifested, and genetic testing for predictive purposes, to anticipate the development of a disease prior to the manifestation of any symptoms. Since diagnostic genetic testing is not speculative, it is much less controversial than predictive testing.¹⁴⁵ It should be similarly non-controversial to distinguish between using a gene-environment interaction to predict future behavior and using it to more accurately understand the effects of past events. By allowing a genetic predisposition to lower the bar for removing a child from the home, we are not predicting that a particular child will become violent; we are only asserting that, in general, children with this genotype are more seriously affected by abuse in the long run than children with other genotypes.

5. Release of the Information to Third Parties

When the State is considering a release of information in a child abuse case, the general goal should be to maintain the child's confidentiality in the face of often lengthy court supervision. Super-privacy measures, even beyond what is typical for a child abuse case,

143. See STATE OF TENNESSEE, ADMINISTRATIVE POLICIES AND PROCEDURES: 14.1, Child Protective Services Risk Assessment, *supra* note 111 and accompanying text.

144. This is not to imply that genetic differences result in some children suffering more or less as a result of being abused, but only that the long term, societal, and intergenerational effects are different.

145. See ENHANCING THE OVERSIGHT OF GENETIC TESTS, *supra* note 89, at 19 (discussing the increased uncertainties associated with predictive testing).

would be appropriate to protect genetic information. While the State's interests in preventing future crime may provide justification for allowing testing, the individual child's interest in maintaining his privacy and avoiding discrimination provide even stronger justifications for implementing heightened confidentiality safeguards.

What potential harm could come from public disclosure of such genetic-environmental predispositions? As discussed earlier, it is easy to imagine a potential employer treating the now adult child as he would an already convicted felon, refusing to employ him out of fear that he is more likely to cause trouble or to get arrested. Similarly, health or life insurers might consider the individual to be a higher risk and charge higher premiums or refuse coverage altogether.¹⁴⁶ Furthermore, there are intangible harms such as embarrassment and social isolation that can result from the release of genetic information.¹⁴⁷ On purely moral grounds, privacy advocates argue that individuals have a right to control the release of their private medical information just as they have a right to control invasions of their physical integrity.¹⁴⁸

Following the "understanding the past versus predicting the future" principles laid out above, teachers and foster parents should only be privy to genetic information if they are an integrated part of a treatment plan designed to address the effects of the past abuse. They should not be informed simply to watch out for the development of behavioral problems. Predictive approaches are discriminatory and prone to problems of stigma and self-fulfilling prophecies.¹⁴⁹ While these risks remain present even with on going treatment programs, they are balanced against the potential benefits of integrated treatment.

VIII. CONCLUSION

In the rush to apply the latest research, institutions may oversimplify the complex and poorly understood relationship between genetics and environment. And in the urgency to find solutions to social problems, they may compromise or obscure important values of equality, justice,

146. For a rationale why such actions should not be allowed, see Silvers & Stein, *supra* note 68, at 1379-95.

147. Peter D. Jacobson, *Medical Records and HIPAA: Is It Too Late to Protect Privacy?*, 86 MINN. L. REV. 1497, 1500 (2002).

148. Colin S. Diver & Jane M. Cohen, *Genophobia: What Is Wrong with Genetic Discrimination?* 149 U. PA. L. REV. 1439, 1445 (2001) (concluding, on several grounds, "that an individual should have a prima facie right to control the dissemination of information about her body").

149. See *supra* Part III.B.1.

and privacy. . . . Placing responsibility for social problems on the traits or predispositions of certain individuals can justify policies of discrimination or exclusion in the interest of enhancing efficiency or maintaining social control.¹⁵⁰

It is difficult to fully appreciate the meaning and interpretation of gene-environment predispositions, especially in a cultural context all too quick to label and stereotype. The Caspi Study represents a great step forward in establishing a healthy middle ground regarding genetic determinism. It integrates biology and environment, nature and nurture, while still acknowledging that the presence of free will can confound the statistics and upset the predictive apple cart at any time.

The future challenge for jurists and policy makers, as more gene-environment interactions are researched and identified, will be to avoid the seductiveness of simple prediction in favor of a more careful and disciplined exercise of forethought. What are the implications of this research for society, for the child, and for the family? What is the responsibility of our legal institutions to the parties that are not represented, the potential future victims of violence? What can we do now, before genetic testing becomes a commonplace occurrence, to balance the interests of individuals and of society? If courts and policy makers do not face these questions now, then our legal institutions may parallel our popular culture in its developing understanding of the predictive power of genetics. In that case, many innocent people, whose only crime is being born with the wrong genes and into the wrong situation, will be treated as if they had already committed a crime. The fictional future of *Minority Report* would surely play out in reality.

150. See NELKIN & LINDEE, *supra* note 41, at 168.

Despite the risks of using genetic information, comprehensive inclusive research such as the Caspi Study has great practical promise. If validated, it helps to explain why people act violently. Such information could be invaluable in developing pro-active interventions to prevent the horror and devastation that results from violence for both the victim and the perpetrator. These potential benefits mean that the Caspi Study cannot be ignored. Policymakers, legislators, and judges must thoroughly understand behavioral predispositions created by gene-environment interactions before applying them to real individuals. This Note provides guidance on how best to address the legal and ethical questions now emerging from the field of behavioral genetics.

*Robert D. Stone**

* I would like to thank Dr. Ellen Wright Clayton for her guidance and advice, as well as her invaluable explanation of behavioral statistics, my editors Melinda, Wendee, and Jon; my parents for always encouraging me to be true to myself; and last, but certainly not least, my wife Angela for her love, laughter, and endless support.