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The Nature and Nurture of Violence: Early Intervention Services for the Families of MAOA-Low Children as a Means to Reduce Violent Crime and the Costs of Violent Crime Note

Jennifer Brooks-Crozier

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THE NATURE AND NURTURE OF VIOLENCE: EARLY INTERVENTION SERVICES FOR THE FAMILIES OF MAOA-LOW CHILDREN AS A MEANS TO REDUCE VIOLENT CRIME AND THE COSTS OF VIOLENT CRIME

JENNIFER BROOKS-CROZIER

In 1993, scientist Hans Brunner discovered that several male members of a large Dutch family who exhibited behaviors such as impulsive aggression, arson, and attempted rape possessed a mutant copy of the MAOA gene, the gene that codes for the production of the enzyme monoamine oxidase A ("MAOA"). Brunner and his colleagues demonstrated that carrier males produced less MAOA, or were "MAOA-low." They hypothesized that this MAOA deficiency caused abnormal aggressive behavior in MAOA-low males. Subsequent research, however, demonstrated that the genetic mutation, acting alone, does not produce the abnormal, aggressive behavior observed by Brunner and his colleagues. In 2002, Avshalom Caspi and a team of New Zealand-based researchers published a ground-breaking study that demonstrated that MAOA-low males who experienced childhood maltreatment were likely to develop abnormal aggressive behavior and become violent offenders. This Note argues that Brunner and Caspi's research can and should be used to prevent violent crime and to preserve the sense of peace and safety that is the foundation of free, civilized societies. More specifically, the Note proposes that states add a screening test for the MAOA-low genotype to their newborn screening programs and that states then offer "Part C" early intervention services to families with children who test positive for the genotype. The screening test would allow states to target a population of children at risk of criminal behavior. The intervention services—family education and counseling, home visits, parent support groups, and psychological and social work services—would prevent those at-risk children from suffering the maltreatment that would cause them to later develop aggressive, antisocial behavior. This Note examines the constitutionality and policy implications of the proposed legislation, presents a rudimentary cost-benefit analysis of the legislation, and ultimately concludes that it would pass constitutional muster and be a cost-effective public policy.
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THE NATURE AND NURTURE OF VIOLENCE: EARLY INTERVENTION SERVICES FOR THE FAMILIES OF MAOA-LOW CHILDREN AS A MEANS TO REDUCE VIOLENT CRIME AND THE COSTS OF VIOLENT CRIME

JENNIFER BROOKS-CROZIER*

I. INTRODUCTION

The crimes that have the most devastating effect on a community are not those motivated by malice, greed, or jealousy, but rather those that seem to strike at random at a community’s innocents—those crimes without any cognizable or articulable motive. Such crimes chip away at that sense of peace and safety that is the great end of individuals’ entering into society. The laws established in society are meant to preserve that sense of peace and safety. Laws, however, are impotent against crime that is not the product of a rational mind because the law presumes that people can be persuaded to abide by its dictates.¹

The law’s inability to deter crime that is not the product of a rational mind has fueled, in part, the centuries-old search for a biological basis for criminal behavior. Scientists, beginning with the phrenologists of the early nineteenth century, have long speculated that if the propensity to engage in criminal behavior has a biological basis, perhaps it can be “cured,” or, more ominously, perhaps those who possess that propensity can be identified and somehow prevented from committing a criminal act.² As forensic psychologist Steven Erickson has asserted, scientists have long

¹See Steward Mach. Co. v. Davis, 301 U.S. 548, 590 (1936) (“[T]he law has been guided by a robust common sense which assumes the freedom of the will as a working hypothesis in the solution of its problems.”); United States v. Currens, 290 F.2d 751, 773 (3d Cir. 1961) (“The concept of mens rea, guilty mind, is based on the assumption that a person has a capacity to control his behavior and to choose between alternative courses of conduct. This assumption . . . is necessary to the maintenance and administration of social controls.”); Steven K. Erickson, Blaming the Brain, 11 MINN. J. L. SCI. & TECH. 27, 65–66 (2010) (“It is axiomatic that to blame an agent of criminal conduct is to accuse her of possessing a guilty mind at the time of the offense.”).

²See GEORGE COMBE, ELEMENTS OF PHRENOLOGY 36–40, 42–44 (1828) (explaining that the faculties of “combativeness,” “destructiveness,” and “secretiveness,” determined by “organs” situated at the “inferior and posterior or mastoid angle of the parietal bone,” “immediately above . . . the external opening of the ear,” and “at the inferior edge of the parietal bones,” respectively, produce various aggressive or criminal behaviors, such as the propensity to attack, the impulse to destroy, and “lying, duplicity, . . . deceit,” and “theft”); FRANCIS GALTON, HEREDITARY GENIUS: AN INQUIRY INTO ITS LAWS AND CONSEQUENCES 1 (1869) (arguing that humankind can and should select for various desirable traits—and, it follows, weed out various undesirable traits—among human beings by breeding them as it breeds dogs or horses).
believed themselves to be better suited for handling criminal justice policy than lawyers.\textsuperscript{3}

The twenty-first century search for a biological basis for criminal behavior has manifested itself in the search for a crime gene.\textsuperscript{4} In 1993, scientists engaged in that search heralded an important victory. Hans Brunner discovered that several male members of a large Dutch family who exhibited behaviors such as impulsive aggression, arson, and attempted rape possessed a mutant copy of the \textit{MAOA} gene, the gene that codes for the production of the enzyme monoamine oxidase A ("MAOA").\textsuperscript{5} Brunner and his colleagues demonstrated that the mutation caused an MAOA deficiency in carrier males—that is, carrier males produced less MAOA,\textsuperscript{6} or were "MAOA-low."

MAOA metabolizes serotonin, dopamine, and norepinephrine—neurotransmitters that regulate emotion, sleep, appetite, motivation, reward and punishment, and the fight-or-flight response.\textsuperscript{7} In "MAOA-high" males, serotonin, dopamine, and norepinephrine are released from the presynaptic neuron into the synaptic cleft in response to a stimulus, bind to receptors on the postsynaptic neuron creating the neural impulses necessary to respond to that stimulus, and are then reabsorbed by the presynaptic neuron and metabolized by MAOA.\textsuperscript{8} "MAOA-low" males are unable to effectively metabolize these neurotransmitters.\textsuperscript{9} Brunner and his colleagues hypothesized that this MAOA deficiency and resulting lack of MAOA activity caused abnormal aggressive behavior in MAOA-low males.\textsuperscript{10}

\textsuperscript{3} Erickson, supra note 1, at 34 ("[Proponents of neurolaw] consider crime the product of impaired brains and scientists are best suited for handling criminal justice policy, not lawyers. Once crime is understood as a behavioral problem rooted in the impaired brains of many unfortunate citizens, ameliorating crime will properly involve civil remedies instead of criminal ones.").


\textsuperscript{6} Id. at 579.


\textsuperscript{8} A synapse is a junction at which a neuron passes a signal to another cell. \textit{Id.}

\textsuperscript{9} Avshalom Caspi et al., \textit{Role of Genotype in the Cycle of Violence in Maltreated Children}, 297 SCI. 851, 851 (2002). Caspi and his colleagues explain that the MAOA enzyme “metabolizes” neurotransmitters. \textit{Id.} Nerve impulses are transmitted at synapses by the release of chemicals called neurotransmitters. As a nerve impulse reaches the end of a presynaptic axon, or cell, molecules of neurotransmitter are released into the synaptic cleft. The molecules of neurotransmitter then bind to specific receptors on the surface of the postsynaptic cell. Once the nerve impulse has been transmitted, the presynaptic cell reabsors the molecules of neurotransmitter and they are then metabolized, or rendered inactive—in the case of epinephrine, norepinephrine, dopamine, and serotonin, by MAOA. \textit{THE MEDICAL BIOCHEMISTRY PAGE}, supra note 7.

\textsuperscript{10} Brunner et al., supra note 5, at 578.
Subsequent research, however, demonstrated that the genetic mutation, acting alone, does not produce the abnormal aggressive behavior observed by Brunner and his colleagues. In 2002, Avshalom Caspi and a team of New Zealand-based researchers published a ground-breaking study that demonstrated that MAOA-low males who experienced childhood maltreatment were far more likely to develop abnormal aggressive behavior and become violent offenders than their MAOA-high peers.\footnote{Caspi et al., supra note 9, at 853.} Caspi and his colleagues concluded that monoamine oxidase A tempers the effect of childhood maltreatment, and that maltreated children who produce high levels of the enzyme, in other words, those who are “MAOA-high,” are less likely to develop abnormal aggressive behavior.\footnote{Id. at 852.}

The Brunner and Caspi studies and their progeny have attracted the rapt attention of legal scholars. At one extreme are scholars who proclaim that the studies, part of a larger movement within the scientific community called “the new neuroscience,”\footnote{Erickson, supra note 1, at 36.} are harbingers of a new legal order, where the law views brains as “the exclusive agents of behavior[,] . . . incapable of blame because of their mechanical and determined nature.”\footnote{Id. at 853.} At the other extreme are scholars who urge a more cautious approach to the new neuroscience, pointing out that the “mind is [not necessarily] accessible, measurable, [or] predictable”\footnote{Id. at 28.} and that “no one yet really knows what forms the basis for the myriad of psychopathic behaviors, especially those where the degree of free will, intention, and self-control by the accused cannot be fully known.”\footnote{Id. at 31. Erickson argued that society will ultimately reject the new neuroscience because it, with its mechanistic accounts of behavior, is divorced from society’s intuitive sense of justice. “[T]he notion of evil,” he argued, “is solidly ingrained in our culture and legal traditions.” Steven K. Erickson, Mind Over Morality, 54 BUFF. L. REV. 1555, 1564–65 (2007) (reviewing CHARLES PATRICK EWING & JOSEPH T. MCCANN, MINDS ON TRIAL (2006)). People believe that the worst crimes involve intentionality and wickedness. Professors Joshua Greene and Jonathan Cohen, however, make the compelling argument that society’s intuitive sense of justice is changing. They argue that our sense of ourselves as free actors, separate from the deterministic processes that work upon the physical world, will soon go the way of “other similarly narcissistic beliefs that we have cherished in our past: that the Earth lies at the centre of the universe, that humans are unrelated to other species.” Joshua Greene & Jonathan Cohen, For the Law, Neuroscience Changes Nothing and Everything, 359 PHIL. TRANSACTIONS ROYAL SOC’Y LONDON B: BIOLOGICAL SCI. 1775, 1781 (2004). What people really want to know is “[w]as it him, or was it his genes? Was it him, or was it his circumstances?” Id. at 1778–79. And when people come to believe that there is no “him” independent of these other things, they will no longer seek to distinguish the truly, deeply guilty—the wicked—from those who are mere victims of genotype and environment for the purpose of meting out punishment, but will rather punish for practical reasons.}
The studies have also found their way into the courtroom. In March 2009, Polk County, Tennessee prosecutors tried Bradley Waldroup for the brutal slaying of Leslie Bradshaw.\textsuperscript{17} Waldroup shot Bradshaw, his ex-wife's friend, eight times with a 22-caliber rifle and “sliced her head open” with a machete.\textsuperscript{18} He then turned his rage on his ex-wife, shooting her in the back as she attempted to flee, hacking at her with a pocket knife, and beating her with a shovel.\textsuperscript{19} Polk County prosecutor Cynthia Lecroy-Schemel remarked, “[t]here are murders and then there are . . . hacking to death, trails of blood.”\textsuperscript{20} Trial judge Carroll Ross called the killing “one of the most senseless, brutal slayings [he had] ever witnessed in [his] entire career.”\textsuperscript{21}

At trial, Waldroup presented expert testimony to the effect that because he possessed the MAOA-low variant of the MAOA gene and had been maltreated as a child, he was “unable to engage in the reflection and judgment necessary to premeditate the crimes”\textsuperscript{22} and thus could not have committed first-degree murder, a crime punishable by death.\textsuperscript{23} The jury accepted Waldroup's defense and found him guilty of voluntary

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\textsuperscript{18} Id.

\textsuperscript{19} Id. Miraculously, Ms. Waldroup survived her ex-husband's brutal attack.

\textsuperscript{20} Id., supra note 17.


\textsuperscript{22} Id., supra note 17.

\textsuperscript{23} Id. The Tennessee Code defines “first-degree murder” as “[t]he premeditated and intentional killing of another.” The Code defines “premeditation” as, an act done after the exercise of reflection and judgment . . . [t]he intent to kill must have been formed prior to the act itself. It is not necessary that the purpose to kill pre-exist in the mind of the accused for any definite period of time. The mental state of the accused at the time the accused allegedly decided to kill must be carefully considered in order to determine whether the accused was sufficiently free from excitement and passion as to be capable of premeditation.

\textsuperscript{20} TENN. CODE. ANN. § 39-13-202 (2010).
manslaughter.\cite{24} One juror remarked that “[t]here was more to [Waldroup’s] whole life that led to [the killing]”—namely, his genetic makeup “[a]nd his background—nature vs. nurture.”\cite{25} Another juror, who felt that the expert testimony was a “major factor” in the jury’s decision, mused that Waldroup didn’t “tick right,” and that “[s]ome people without [the genetic variant] would react totally different than he would” in similar circumstances.\cite{26} Judge Ross sentenced Waldroup to six years for the killing—the maximum allowed under Tennessee law.\cite{27}

This Note does not attempt to add to the voluminous body of scholarship that explores the legal and social ramifications of the scientific research that provided the basis for Waldroup’s defense. It does not suggest—or dismiss the possibility—that such research will bring about a radical overhaul of criminal law’s constructions of free will and personal responsibility. Rather, this Note argues that such research can, and should, be used to prevent senseless and brutal slayings of the sort recounted above—to preserve that sense of peace and safety that is the foundation of free, civilized societies. More specifically, this Note proposes that states add a screening test for the MAOA-low genotype to their newborn screening programs and that states then offer “early intervention services” to families with children who test positive for the genotype. The screening test would allow states to target those children at risk of criminal behavior. The intervention services—family education and counseling, home visits, parent support groups, and psychological and social work services—would be designed to prevent those at-risk children from suffering the maltreatment that could cause them to later develop aggressive, antisocial behavior. The Note examines the constitutionality and policy implications of the proposed legislation, presents a rudimentary cost-benefit analysis of the legislation, and ultimately concludes that it would both pass constitutional muster and be a cost-effective public policy.

II. THE GENOTYPE-ENVIRONMENT INTERACTION

Caspi et al.’s study uncovered a powerful interaction between an individual’s genotype and his environment—the effect of childhood maltreatment on antisocial behavior was significantly greater among males with the MAOA-low genotype than among males with the MAOA-high

\begin{footnotesize}
\begin{enumerate}
\item Waldroup Guilty, supra note 17. The Tennessee Code defines “voluntary manslaughter” as “the intentional or knowing killing of another in a state of passion produced by adequate provocation sufficient to lead a reasonable person to act in an irrational manner.” TENN. CODE ANN. § 39-13-211.
\item Hagerty, supra note 18.
\item Id.
\item South, supra note 21. Waldroup received twenty-six additional years for other offenses with which he had been charged and convicted, including aggravated kidnapping, for a thirty-two year total sentence. Id.
\end{enumerate}
\end{footnotesize}
genotype. MAOA-low males who experienced childhood maltreatment had 2.8 times the odds of developing adolescent conduct disorder and 9.8 times the odds of committing a violent crime as MAOA-low males who had not been maltreated as children. Maltreatment did not confer a similar risk on MAOA-high males. Eighty-five percent of MAOA-low males who had been severely maltreated as children developed some form of antisocial behavior, and although MAOA-low males who had experienced childhood maltreatment constituted only twelve percent of the male cohort, they accounted for forty-four percent of the cohort’s violent convictions, “yielding an attributable risk fraction . . . comparable to that of the major risk factors associated with cardiovascular disease.”

Recent research drawing on technological innovations in the arena of magnetic resonance imaging suggests that abnormal neurotransmitter activity in MAOA-low males subjected to childhood maltreatment may result in damage to the affected individual’s orbital prefrontal cortex—a region of the brain involved in social interactions, the inhibition of impulsive behavior, ethics, morality, reward and punishment, regret, and the projection of future outcomes. If an individual’s orbital cortex is damaged, he is much less capable of inhibiting aggression, violence, and addiction.

When this damage occurs is critical. One study concluded that MAOA confers a protective effect only early in life, prior to fifteen years of age, “when the brain is more vulnerable . . . to behavioral insults.” Another study asserted that the timing of the injury determines the type of antisocial behavior manifested. The study’s results revealed three broad categories...

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28 Caspi et al., supra note 9, at 853.
29 Id. MAOA-high males who experienced childhood maltreatment had only 1.54 times higher odds of developing adolescent conduct disorder and 1.63 times the odds of committing a violent crime than MAOA-high males who had not been maltreated as children. Id. The Caspi team assessed adolescent conduct disorder according to criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and identified convictions for violent crimes via the Australian and New Zealand police. Id. at 852.
30 Id. at 853. Caspi and his colleagues acknowledged that antisocial behavior is a “complicated phenotype” and that methods used to measure it are marked by various strengths and weaknesses. Id. at 852; see also Guang Guo et al., The VNTR 2 Repeat in MAOA and Delinquent Behavior in Adolescence and Young Adulthood: Associations and MAOA Promoter Activity, 16 EUR. J. HUMAN GENETICS 626, 628 (2008) (acknowledging the challenges inherent in measuring delinquency and crime).
31 Caspi et al., supra note 9, at 853.
32 Fallon, supra note 16, at 347. For an extended discussion of functional magnetic resonance imaging (fMRI) technology and its use in research on the criminal mind, see generally Teneille Brown & Emily Murphy, Through a Scanner Darkly: Functional Neuroimaging as Evidence of a Criminal Defendant's Past Mental States, 62 STAN. L. REV. 1119 (2010).
33 Fallon, supra note 16, at 347.
34 Id.
of antisocial behavior. Children who sustain orbital cortex damage prior to two to three years of life manifest violent behavior "without knowing what they are doing is wrong;" children who sustain orbital cortex damage after the second or third year of life through "about puberty" manifest violent behavior and "know[ ] what they are doing is wrong, but . . . cannot control the impulse to act;" and children who sustain damage occurring after puberty manifest violent behavior "with full knowledge of the morality and consequences involved, but with a highly variable ability to inhibit the impulses" that compel such behavior.\(^3\)

There is no one, specific kind of maltreatment that can cause the damage that leads to later aggressive, antisocial behavior. Caspi et al. characterized childhood maltreatment as "erratic, coercive, and punitive parenting,"\(^36\) or, more specifically, maternal rejection, repeated loss of a primary caregiver, harsh discipline, physical abuse, or sexual abuse.\(^37\) Other researchers, building on Caspi et al.'s work, defined childhood maltreatment differently, hypothesizing that MAOA-low males are at risk for developing conduct disorder when exposed to a variety of childhood adversities.\(^38\) Foley et al., for example, studied the effects of interparental violence, parental neglect, and inconsistent discipline on MAOA-low males.\(^39\) The study demonstrated a significant interaction between MAOA deficiency and each of these three adverse factors.\(^40\)

These studies suggest that MAOA-low males need not be exposed to devastating violence in childhood in order to exhibit aggressive, antisocial behavior later in life. The degree of aggressive, antisocial behavior exhibited, however, does vary depending on two factors: the effectiveness with which the individual's MAOA gene is transcribed and the level of maltreatment to which the individual is exposed.

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\(^3\) Fallon, \textit{supra} note 16, at 341.

\(^36\) Caspi et al., \textit{supra} note 9, at 851.


\(^38\) Id. at 738–39.

\(^39\) Id. at 739. Foley et al. assessed adversities by means of a personal interview. To determine whether subjects had been exposed to parental neglect, researchers asked subjects' parents (1) whether anyone had ever told them they were not looking after their children properly; (2) whether anyone had ever thought that one of the children had become ill because the children had not been looked after properly; and (3) whether there had been a time when one of the children was very ill but the parent doubted whether he or she needed to see a doctor. To determine whether subjects had been exposed to interparental violence, researchers asked subjects (1) whether their parents had ever pushed or shoved each other during an argument, and (2) whether their parents hit each other when they fought. Finally, to determine whether subjects had been exposed to inconsistent discipline, researchers asked subjects whether a parent was strict one day and then the next day did not seem to care whether they broke a rule or not. \textit{Id.}

\(^40\) Id. at 740. Interestingly, researchers discovered that after controlling for the interaction between low MAOA activity and childhood adversity and the main effect of adversity, low MAOA activity was associated with a lower risk of conduct disorder. \textit{Id.}
Whether any gene performs its function effectively depends in large measure on the effectiveness with which the gene’s “promoter” transcribes the gene.\(^4\) Research on the MAOA gene has identified a 30-basepair (“bp”) variable number tandem repeat (“VNTR”) in the promoter region of the MAOA gene.\(^4\) The 30-bp VNTR can repeat itself 2, 3, 3.5, 4, or 5 times.\(^4\) The 3 and 4 repeats occur more frequently in the population than the 2, 3.5, or 5 repeats.\(^4\) The 3 repeat occurs in approximately one-third of the male population and the 4 repeat occurs in approximately two-thirds of the male population.\(^4\) Individuals whose genes have 3.5 or 4 repeats of the VNTR transcribe more efficiently than individuals whose genes have 3 or 5 repeats of the VNTR.\(^4\) The 2-repeat sequence of the MAOA promoter displays the lowest level of promoter activity.\(^4\)

Guo et al. demonstrated that males with 2 repeats of the VNTR exhibit delinquent behavior at twice the rate of males with any of the other variants.\(^4\) Caspi et al. and Kim-Cohen et al. found a higher level of violent behavior for 3 repeats than 4 repeats among males who were maltreated in childhood.\(^4\)

The level of maltreatment to which a child is exposed also determines the likelihood that he will later exhibit aggressive, antisocial behavior.

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\(^{41}\) A gene’s promoter is a region of DNA that promotes, or facilitates, the transcription of that particular gene. How effectively a promoter transcribes a gene determines how much of a particular protein is synthesized by the operations of that gene. Transcription is the process by which promoter transcribes the gene, then less MAOA will be produced. See generally BENJAMIN A. PIERCE, GENETICS: A CONCEPTUAL APPROACH 345-46, 348-49, 358-59 (Jerry Correa et al. eds., 3d ed. 2008).

\(^{42}\) See Guo et al., supra note 30, at 627. A tandem repeat involves multiple copies of an identical DNA sequence arranged in direct succession in a particular region of a chromosome. A variable number tandem repeat is a tandem repeat which is repeated a different number of times in different individuals. The VNTR described by MAOA-gene researchers contains thirty base pairs. A base pair is composed of two complementary nucleotides: A (adenine)—T (thymine) or C (cytosine)—G (guanine). A 5-bp VNTR might look something like this: ATTCGATTCGATTCGATTCG (four repeats). In another individual, the 5-bp VNTR might look like this: ATTCGATTCGATTCG (three repeats). See generally DANIEL L. HARTL & ELIZABETH W. JONES, GENETICS: ANALYSIS OF GENES AND GENOMES 67 (7th ed. 2009).

\(^{43}\) Guo et al., supra note 30, at 627.

\(^{44}\) Id.

\(^{45}\) See Foley et al., supra note 37, at 740 (reporting that the frequency of each allele in a population of 514 white male twins from the Virginia Twin Study for Adolescent Behavioral Development was 2 repeat, 0.39%; 3 repeat, 28.79%; 3.5 repeat, 2.33%; 4 repeat, 68.29%; and 5 repeat, 0.19%); J. Kim-Cohen et al., MAOA, Maltreatment, and Gene-Environment Interaction Predicting Children’s Mental Health: New Evidence and a Meta-Analysis, 11 MOLECULAR PSYCHIATRY 903, 906 (2006) (reporting that the frequency of each allele in a population of 1116 seven-year-old boys in England and Wales was 2 repeat, 0.2%; 3 repeat, 31.9%; 3.5 repeat, 2.1%; 4 repeat, 64.2%; and 5 repeat, 1.6%).

\(^{46}\) Guo et al., supra note 30, at 627.

\(^{47}\) Id. at 631-32.

\(^{48}\) Id. at 629.

\(^{49}\) Id. at 632; Kim-Cohen et al., supra note 45, at 910.
Foley et al. grouped males into four categories: “1” through “4.” Those in category 4 experienced the most severe maltreatment; those in category 1 experienced the least severe maltreatment. One hundred percent of MAOA-low males who experienced category-4 maltreatment developed conduct disorder, whereas only fifteen percent of MAOA-low males who experienced category-1 maltreatment developed conduct disorder. Perhaps most significant, no MAOA-high males who experienced category-4 maltreatment developed conduct disorder.

Thus whether a male exhibits nonviolent, antisocial behaviors such as stealing, breaking and entering, and drug dealing, or violent, antisocial behaviors such as physical fighting, shooting, or stabbing someone, depends, in part, on both the effectiveness with which the individual’s MAOA gene is transcribed and the level of maltreatment to which the individual is exposed. In other words, males who possess either the 2-repeat or 3-repeat sequence of the MAOA promoter and are exposed to severe childhood maltreatment have been dealt an exceptionally bad hand.

It is difficult at this point to estimate the extent to which maltreated, MAOA-low males contribute to the violent crime rate in the United States, in part because states do not currently screen for the MAOA-low genotype. Using Caspi et al.’s numbers, one might estimate that maltreated, MAOA-low males account for roughly forty-four percent of the nation’s violent crimes. If the states, by means of legislation like that proposed here, could prevent all of them from suffering the maltreatment that causes them to later develop aggressive, antisocial behavior, violent crime in the United States could drop by almost half.

III. THE PROPOSED LAW

A. Mandatory Newborn Screening

Although the concept of “mandatory genetic screening” evokes images of a post-apocalyptic future, not unlike those portrayed in the films

50 Foley et al., supra note 37, at 741 tbl.1.
51 Id. at 741–42. The level of exposure to childhood maltreatment refers to seven items used to survey parental neglect, exposure to interparental violence, and inconsistent parental discipline. Id. at 742.
52 Id. at 742 tbl.2.
53 Id.
54 Caspi et al., supra note 9, at 853. There are problems extrapolating from New Zealand to the United States. First, the genetic composition of the New Zealand population is likely different from that of the United States, at least with respect to the MAOA gene. Second, the incidence of maltreatment in New Zealand is likely different from that of the United States. Nevertheless, the point survives. Even if maltreated, MAOA-low males account for far less than forty-four percent of the nation’s violent crimes—say, twenty-five percent—it is a substantial enough number to warrant government action.
Minority Report and Gattaca, mandatory genetic screening is, in fact, common. Newborn screening began in the United States in the 1960s, when scientists developed a screening test for phenylketonuria ("PKU"). Today, every state has a newborn screening program. These programs vary widely; the number of genetic and metabolic disorders included in state screening programs ranges from four to thirty-six. All states mandate screening for PKU, and most states mandate screening for several disorders. At present, however, no state mandates screening for a genetically-based, environmentally-triggered disorder such as the abnormal, aggressive behavior caused by the interaction between the MAOA-low genotype and childhood maltreatment.

This Note proposes that states add to their newborn screening programs a mandatory screening test for the MAOA-low genotype. The policies and practices governing the administration of the test would conform to those already in place in most states. All children, male and female, would be tested within forty-eight hours of birth. If the child were delivered at home, and the birth were not attended by a physician, the person registering the birth would be responsible for ensuring that the screening test be performed within forty-eight hours of the child's birth.

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55 MINORITY REPORT (Twentieth Century Fox 2002); GATTACA (Columbia Pictures 1997); see also Robert D. Stone, Note, The Cloudy Crystal Ball: Genetics, Child Abuse, and the Perils of Predicting Behavior, 56 VAND. L. REV. 1557, 1558, 1563 (2003) (analyzing Minority Report and Gattaca as commentaries on preventative policing and genetic determinism).


57 Id. at 4. PKU is a genetic disorder characterized by the inability to process the protein phenylalanine. If left untreated, PKU can result in symptoms including brain damage and severe mental retardation. See generally MEDLINEPLUS MEDICAL ENCYCLOPEDIA: PHENYLKETONURIA, http://www.nlm.nih.gov/medlineplus/phenylketonuria.html (last visited Sept. 30, 2011).

58 GAO REPORT, supra note 56, at 1.

59 Id. at 1, 8.


61 Scientists consider the 2-repeat, 3-repeat, and 5-repeat alleles “MAOA-low,” because the promoter regions of these alleles transcribe the MAOA gene less effectively and result in the underproduction or lack of production of MAOA. Recall that the 2-repeat and 5-repeat alleles are very uncommon in the general population—0.2% and 1.6%, respectively—and that the 3-repeat allele is very common—31.9%. See supra note 45 and accompanying text.

62 Most states have adopted similar practices for administering their screening programs. GAO REPORT, supra note 56, at 8.

63 See, e.g., NEB. REV. STAT. § 71-519(2) (2009) (“If a birth is not attended by a physician and the infant does not have a physician, the person registering the birth shall cause such tests to be performed within the period and in the manner prescribed by the [Department of Health and Human Services].”).
The cell sample would be extracted by a buccal smear, as opposed to a blood draw, and then sent to a laboratory where technicians would examine the sample for the relevant genetic variant.\textsuperscript{64}

Those who administered the screening test would directly notify the child’s health-care provider and the state’s department of health of an abnormal test result.\textsuperscript{65} The health-care provider would inform the child’s parent or guardian of the result, educate the parent or guardian regarding the nature of and prognosis for an MAOA deficiency, outline a plan of treatment for the family, and confirm that treatment had begun. The state, too, would follow up with the child’s parent or guardian to refer the family for treatment and encourage participation.

If parents refused to submit their child for screening, the state would bring an action against them to compel them to comply. If the state were successful, it would obtain a court order directing the parents to submit their child for screening as required by the statute. The statute would allow for no exceptions.

A clear security issue is presented by this scenario. This Note proposes a set of comprehensive confidentiality measures to ensure the child’s protected health information is not disclosed to the general public. A set of protections along the following lines would likely suffice. First, test results would be delivered to a “receiving room” at the state’s health department each month. A staff member would sort, code, and log the results and then take them to another room where the data would be entered into a computer. Thereafter, the results would be returned to the receiving room to be retained in a vault for a five-year period and then destroyed. The receiving room would be surrounded by a locked wire fence and protected by an alarm system. The screening-test data would be encrypted and the files containing the data password protected. When the files were accessed, the computer would be run “off-line” so that no terminal outside of the computer room could read or record the protected information. Further, public disclosure of the screening-test results would be expressly prohibited by statute and by health department regulation. Violation of the prohibitions would carry a stiff penalty, up to one year in prison or a $2000 fine.\textsuperscript{66}

One might question the wisdom of testing both male and female children. The \textit{MAOA} gene is located on the X chromosome. Thus, males,

\textsuperscript{64} A buccal smear is a process in which a medical provider or technician uses a small brush or cotton swab to collect a sample of cells from the inside surface of the subject’s cheek. \textsc{medlineplus medical encyclopedia: buccal smear, supra note 57.}

\textsuperscript{65} Fewer than half of states require that test administrators notify parents directly of an abnormal test. \textsc{gao report, supra note 56, at 3, 13.}

\textsuperscript{66} Confidentiality measures adapted from those outlined in \textit{Whalen v. Roe}, 429 U.S. 589, 594–595 (1977). In \textit{Whalen}, the Court held these measures “evidence[d] a proper concern with, and protection of, the individual’s interest in privacy.” \textit{Id.} at 605.
who have only one X chromosome, possess only one copy of the gene, whereas females, who have two X chromosomes, possess two copies of the gene. Brunner et al. discovered that MAOA activity in carrier females was not different from that of noncarrier females or unrelated controls. He speculated that this was because carrier females possessed at least one normal, perhaps highly active, copy of the MAOA gene. If carrier females are not vulnerable to maltreatment in the way that carrier males are, there seems little justification for subjecting them to the screening test. States, however, have an interest in identifying female carriers, who would benefit from genetic counseling and other supportive services. A genetic counselor, for example, could educate the female carrier about the MAOA-low genotype and its manifestations; assess the carrier’s risk of passing the genotype on to children; and explain what kinds of supervision and prevention strategies, like early intervention services, might mitigate the risks associated with the MAOA-low genotype. Moreover, there is an extremely rare version of the MAOA-low variant—occurring in approximately 0.2% of the general population—that affects both male and female carriers. Carriers of this genetic mutation exhibit abnormal aggressive behavior even in the absence of childhood maltreatment. Failing to screen females would thus result in the inability to identify those females afflicted by this rare genetic mutation and the inability to offer their families essential supportive services.

B. Offering State Support and Supervision

That a state would supervise families with children who test positive for genetic disorders sounds even more like a science-fiction storyline than does mandatory genetic screening. Such supervision, however, is not without precedent. The Individuals with Disabilities Education Act (“IDEA”) governs how states and public agencies provide special education and related services to children with disabilities from birth to age twenty-one.  

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67 Brunner et al., supra note 5, at 579.
68 Id. If a female possessed two mutant copies of the MAOA gene, she would likely express the traits associated with the mutation. Generally, however, females are protected from X-linked traits because those traits are recessive and because females often express only one X chromosome—the other a “Barr body,” an inactive X chromosome. See generally ETHEL SLOANE, BIOLOGY OF WOMEN 133 (Cathy L. Esperti et al. eds., 4th ed. 2002).
69 Kim-Cohen et al., supra note 45, at 906; Guo et al., supra note 30, at 631–32.
70 Guo et al., supra note 30, at 631–32.
71 20 U.S.C. §§ 1400, 1413–1440 (2006). The IDEA is “spending clause” legislation—that is, it only applies to states that accept federal funding under its provisions. The IDEA defines a “child with a disability” as a child “with mental retardation, hearing impairments . . . speech or language impairments, visual impairments . . . serious emotional disturbance . . . orthopedic impairments, autism, traumatic brain injury, other health impairments, or specific learning disabilities; and who, by reason thereof, needs special education and related services.” Id. § 1401(3)(A).
States that accept federal funds under “Part C” of the IDEA are required to offer early intervention services to all children, from birth through age three, who experience developmental delay or who are diagnosed with a mental or medical condition that has a high probability of resulting in developmental delay—such as chromosomal abnormalities, genetic or congenital disorders, or severe sensory impairments.\textsuperscript{72} States may serve “at risk” children—children with biomedical risks such as low birth weight, or environmental risks such as parental substance abuse, poverty, or child abuse.\textsuperscript{73}

This Note proposes that states that accept federal funds under the IDEA be required to offer Part C early intervention services to families with children who test positive for the MAOA-low genotype. There is no case law that suggests that testing positive for the MAOA-low genotype constitutes a “diagnosed mental or medical condition that has a high probability of resulting in developmental delay”\textsuperscript{74} within the meaning of the IDEA. This is not to say that an MAOA-low child would not be eligible for early intervention services as an “at risk” child. However, the majority of states serve only those children they are required to serve,\textsuperscript{75} and the group of states that routinely serves at-risk children is growing ever smaller in the face of growing state budget constraints.\textsuperscript{76} Congress, then, would need to amend Part C of the IDEA to ensure that families with MAOA-low children are offered early intervention services.

Early intervention services for an MAOA-low child would look much like those for any child with a diagnosed mental or medical condition, but with some significant differences.\textsuperscript{77} Ordinarily, children are referred to an early intervention program by their by their parents, or in some cases by their public school. Where a child receives an abnormal test result for the MAOA-low genotype, however, the child and his or her family would be referred to the program directly by the medical provider that conducted the

\textsuperscript{72} Id. §§ 1400, 1401(3)(A), 1431–1440.

\textsuperscript{73} U.S. DEP’T HEALTH & HUMAN SERVS. ADMIN. CHILDREN & FAMILIES, NAT’L SURVEY OF CHILD AND ADOLESCENT WELL-BEING: NO. 8: NEED FOR EARLY INTERVENTION SERVICES AMONG INFANTS AND TODDLERS IN CHILD WELFARE 1, available at http://www.acf.hhs.gov/programs/opre/abuse_neglect/nscaw/reports/need_earlyintervention/earlyintervention.pdf. As of 2003, the Child Abuse Prevention and Treatment Act (“CAPTA”) requires that infants and toddlers exposed to maltreatment be referred for Part C early intervention services. Id.

\textsuperscript{74} 20 U.S.C. § 1432.

\textsuperscript{75} Id. Eight jurisdictions currently serve at-risk children: Hawaii, Massachusetts, New Hampshire, California, New Mexico, West Virginia, American Samoa, and Guam. Id. at 1, 6.

\textsuperscript{76} Telephone Interview with Linda Goodman, Dir., Connecticut Birth-to-Three System (Mar. 25, 2011).

\textsuperscript{77} The program described in the ensuing paragraphs is based on New York State’s Early Intervention Program. NEW YORK STATE DEP’T HEALTH, THE EARLY INTERVENTION PROGRAM: A PARENT’S GUIDE, http://www.health.state.ny.us/publications/0532/welcome.htm (last visited Apr. 7, 2011).
screening test. The state would recommend that the child’s family participate in the program and would follow up to encourage participation.

The program’s early intervention official would then assign an initial service coordinator to the family. The initial service coordinator would conduct an initial meeting with the family, at which he or she would educate the family about early intervention services and inform the family of its rights under the early intervention program. The initial service coordinator would then conduct a thorough evaluation of the family and begin gathering information which would serve as the basis for the family’s individualized family service plan (“IFSP”).

After the evaluation was complete, the initial service coordinator would conduct an IFSP meeting with the family, at which the coordinator, in consultation with the family, would specify which services the family required, develop a detailed plan of services (the IFSP), and identify an “ongoing service coordinator.” Because the goal of intervention services for the MAOA-low child would be to prevent the maltreatment that causes later abnormal, aggressive behavior, the centerpiece of an IFSP for a family with an MAOA-low child would be family support services and supervision. The ongoing service coordinator would administer a service plan that would eradicate the adverse factors—maternal rejection, harsh or inconsistent discipline, physical abuse, sexual abuse, interparental violence, and parental neglect—known to trigger aggressive, antisocial behavior in MAOA-low children. Possible services would include family training, counseling, home visits, parent support groups, medical services, psychological services, social work services, and transportation and related costs for indigent families.

Semiannually or annually, the ongoing service coordinator would

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78 The New York State Early Intervention Program lists the following parents’ rights:

[T]o say yes or no to having your child evaluated or screened and taking part in a family assessment; to say yes or no to participating in the Early Intervention Program without risking the right to take part in the future; to say yes or no to any certain type of early intervention service without risking your right to other types of early intervention services; to keep information about your family private; to look at and change your child’s written record under the Early Intervention Program; to be told by your Early Intervention Official about any possible changes in your child’s evaluation or other early intervention services before any changes are made; to take part—and ask others to take part—in all meetings where decisions will be made about changes in your child’s evaluation or services; to use due process procedures to settle complaints; to an explanation of how your insurance may be used to pay for early intervention services.

conduct an IFSP Review, at which the coordinator, again in consultation with the family, would determine whether additional services were required or whether the child should be discharged from the program entirely.

IV. THE PUBLIC INTEREST

The legislation proposed herein implicates various constitutional protections, including the First Amendment's right to freely exercise one's religion, the Fourteenth Amendment's right to direct the education and upbringing of one's children, the Fourteenth Amendment's right to privacy, and the Fourth Amendment's right to be free from unlawful searches and seizures. A court hearing a challenge to the proposed legislation under each of these constitutional guarantees would have to begin by scrutinizing the public interest in mandating newborn screening for the MAOA-low genotype and offering early intervention services to families with MAOA-low children. The court would then need to weigh the public interest against the private interest being asserted.

The Supreme Court, in *Vernonia School District 47J v. Acton*, held that the school district had demonstrated a compelling need to conduct random drug testing of the district's student athletes because the problem posed by student-athlete drug use was real and substantial, and because the means the school district employed to address the problem were effective. In attempting to articulate the public interest in mandating newborn screening for the MAOA-low genotype and offering early intervention services to families with MAOA-low children, this Note asks those same questions: whether the problem posed by MAOA-low males is real and substantial, and whether the means employed to address the problem—mandatory screening and subsequent participation in intervention services—would be effective. This analytical framework resembles that which state legislatures use when determining whether to add a particular disorder to their newborn screening programs: states ask whether the disorder occurs frequently in the general population, can be screened for, and can be treated.

Widely screened-for genetic disorders, like PKU and sickle-cell anemia, present real and substantial problems and are susceptible to treatments such as diet and medication. Screening for the MAOA-low genotype, however, presents unique difficulties. First, a child who tests

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80 Id. at 660, 661, 664–65.
81 GAO REPORT, supra note 56, at 2.
positive for a mutation of the HBB, or hemoglobin, gene is going to
develop sickle-cell anemia and its various debilitating complications. A
child who tests positive for the MAOA-low genotype, however, is not
likely to develop aggressive, antisocial behavior unless he is maltreated. In
fact, in the absence of maltreatment, the MAOA-low child is less likely to
exhibit violent behavior than the MAOA-high child. Second, the
aggressive, antisocial behavior to which the MAOA-low genotype
predisposes MAOA-low males is not treatable in the same ways as PKU or
sickle-cell anemia are. A physician cannot prescribe a specific dietary
regimen or antibiotics in order to prevent a child from becoming a violent
psychopath. Despite these unique difficulties, the following analysis
demonstrates that the public interest in screening newborns for the MAOA-
low genotype is, in fact, compelling.

A. A Real Problem

The 3-repeat variant of the MAOA gene occurs in approximately one-
third of the white male population. In contrast, PKU, for which every
state mandates screening, occurs in about .007% of the general
population. But the MAOA-low genotype alone does not produce
abnormal aggressive behavior. If not maltreated, the MAOA-low child is
not only not likely to develop aggressive, antisocial behavior, he is likely
to be less aggressive than his MAOA-high peers. Thus, in order to
determine how often the “genetic disorder” occurs in the population, one
must measure the number of MAOA-low children who are maltreated.
Caspi et al.’s study of 1037 New Zealand children included about sixty-
five males (twelve percent of the male cohort, six percent of the entire
cohort) who were MAOA-low and had suffered maltreatment. This
frequency is still far greater than the .007% frequency that legislators have

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83 Foley et al., supra note 37, at 742.
84 This goes without saying, in part because an individual’s experience—as this Note
demonstrates—plays a central role in determining whether he or she develops violent psychopathic
tendencies, and diet and antibiotics do not act in any meaningful way on the experiences—such as
childhood maltreatment—that produce violent behavior. James Fallon reports that “the core violent
psychopathic condition [that results from damage to an individual’s orbital prefrontal cortex] appears to
still be impenetrable to intervention or prevention.” Fallon, supra note 16, at 342.
85 Foley et al., supra note 37, at 740; Kim-Cohen et al., supra note 45, at 906.
87 Foley et al., supra note 37, at 742 (“After we controlled for [the interaction between genotype
and environmental adversity], the low-activity MAO-A genotype was associated with a significantly
lower risk for conduct disorder.”).
88 Caspi et al., supra note 9, at 852–53.
determined justifies mandatory screening for PKU.89

B. A Substantial Problem

MAOA-low males who experience childhood maltreatment pose a substantial threat to the health, safety, and welfare of a state’s residents. Researchers at Iowa State University recently reported that every aggravated assault costs the United States $145,379; every rape costs $448,532; every murder costs $17,252,656.90 “That means in 2009... murder cost the United States almost $263 billion—nearly as much the federal government annually spends on Medicaid.”91 Researchers included in their calculations costs such as damaged property, lost careers, prison upkeep, lawyer fees, more frequent police patrols, more complicated alarm systems, and more expensive life-insurance plans.92 The obvious significance of these statistics is that every dollar a state spends on crime is a dollar a state does not spend on health, education, welfare, pensions, transportation, or infrastructure—all expenditures which directly benefit the health, safety, and welfare of a state’s residents.

These statistics are more significant because they are a concrete manifestation of the intangible costs of violent crime—foremost among them the loss of that sense of peace and safety that is the foundation of free, civilized society. And they say nothing of the grievous price paid for violent crime by the victims themselves. It is easy to discuss these

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89 As noted, there are problems extrapolating from New Zealand to the United States. But again, the point survives, because even supposing the United States frequency is only one percent (twelve times lower than in New Zealand), it is still 142 times higher than for PKU.

90 Matt Delisi et al., Murder by Numbers: Monetary Costs Imposed by a Sample of Homicide Offenders, 21 J. FORENSIC PSYCHIATRY & PSYCHOL. 501, 506 (2010). Delisi et al.’s study made use of the monetization procedures developed in a seminal study by Vanderbilt University Professor Mark Cohen, Mark A. Cohen, The Monetary Value of Saving a High-Risk Youth, 14 J. QUANTITATIVE CRIMINOLOGY, 5–33 (1998), with one significant difference. In addition to calculating victim costs, justice-system costs, and the opportunity cost of the offender’s time, i.e., lost productivity, Delisi et al. calculated a “willingness-to-pay,” or WTP, cost. Delisi et al., supra, at 505. In his 1998 study, Cohen acknowledged that “[a]n intrinsic limitation of monetized cost estimates of crime is that they cannot fully capture...[pain and suffering costs].” Id. Cohen et al. recognized, however, that “individuals are willing to pay real dollars and expend real resources to avoid the pain, suffering, and lost quality of life associated with becoming a crime victim.” Cohen et al., supra, at 7. To increase the accuracy of their cost of crime estimates, Delisi et al. calculated WTP estimates—“the amount of money that citizens would be willing to pay to prevent crimes.” Delisi et al., supra, at 505. WTP estimates include “collateral costs,” “prevention expenditures for personal security, avoidant behaviors to safeguard against victimization, third-party costs of insurance, and government welfare programs.” Id. The cost of murder, then, is $4,712,769 in victim costs, $307,355 in justice costs, $143,432 in offender productivity costs, and $12,089,100 in WTP costs—$17,252,656 total. Id. at 506.


92 Id.
intangible costs in the abstract and, as a consequence, fail to give them the
weight they deserve. One need only watch an interview with Dr. William
Petit, the husband and father whose wife and daughters were brutally
murdered during a home invasion in Cheshire, Connecticut in 2007, to get
a sense of the soul-rending grief, the all-consuming emotional and
intellectual devastation wrought by violent crime.93

C. An Effective Means to Address the Problem

As one scholar pointed out, mandatory genetic screening statutes have
attracted “[l]ittle controversy” because “[t]he tests . . . used are highly
accurate.”94 An effective screening test for the MAOA-low genotype does
exist. Test administrators would use a DNA-based test to screen the child
for the MAOA-low variant.95 It goes without saying, however, that
“[i]dentifying a child’s illness or potential illness does him or her no good
unless treatment is actually available and administered.”96 Indeed,
Massachusetts mandates genetic screening only for currently treatable
disorders.97 Again, a physician cannot prescribe antibiotics or a specific
dietary regimen in order to prevent a child from becoming a violent
psychopath.98 Nevertheless, a child can benefit from early detection if that
child’s family participates in early intervention services.99 While early
intervention services are not what we traditionally think of as “treatment,”
they may be the only means of preventing a genetically based,
environmentally triggered behavioral disorder.

Studies show that at least some early intervention programs do work.100
Five major studies have demonstrated that at-risk children who participate
in early intervention programs are much less likely to exhibit aggressive,
antisocial behavior as adolescents and adults than at-risk children who do
not.101 In 1993, for example, Schweinhart et al. conducted a study of 123

93 “How Life Goes on for Dr. William Petit,” Interview by Oprah Winfrey with Dr. William Petit
94 Francy E. Foral, Note, Necessity’s Sharp Pinch: Parental and States’ Rights in Conflict in an
Era of Newborn Genetic Screening, 2 J. HEALTH & BIOMEDICAL L. 109, 110 (2006).
95 See supra note 64 and accompanying text.
96 Foral, supra note 94, at 117.
97 Id.
98 See supra note 84 and accompanying text.
99 Recall that MAOA confers a protective effect only early in life. See supra notes 34–54 and
accompanying text.
100 JONATHAN CRANE & MALLORY BARG, COALITION FOR EVIDENCE-BASED POL’Y, DO EARLY
INTERVENTION STUDIES REALLY WORK? 2 (2003); John J. Donohue III & Peter Siegelman, Allocating
Resources Among Prisons and Social Programs in the Battle Against Crime, 27 J. LEGAL STUD. 1, 15–
101 CRANE & BARG, supra note 100, at 5. Crane and Barg also report that:
African-American children born in poverty who had, between the ages of three and four, attended the HighScope Perry Preschool in Ypsilanti, Michigan.\textsuperscript{102} Student-teacher ratios were very low (one teacher to five students), teachers made weekly ninety-minute home visits to every family, and all teachers were certified in both early childhood and special education. At age twenty-seven, children who had attended Perry Preschool earned more, were more likely to own a home and be married, and were less likely to bear a child out of wedlock or receive welfare benefits than similarly situated children who had not attended the school.\textsuperscript{103} Most significant, the program cut the total number of arrests in half and reduced the rate of “hard-core criminality (defined as an individual having five or more arrests) by four-fifths, from thirty-five percent to seven percent.”\textsuperscript{104}

D. A Compelling Interest

The “disorder” occurs frequently in the population, can be screened for, and is treatable. The threat posed by MAOA-low males is real and substantial and the means adopted by states to confront that threat—mandatory newborn screening for the MAOA-low genotype followed by intervention services—is likely to be effective. Thus a court is likely to find that the state interest in mandating newborn screening for the MAOA-low genotype is compelling.

V. THE PRIVATE INTERESTS

After scrutinizing the public interest in mandating newborn screening

\begin{flushleft}
\textsuperscript{103} Id.
\textsuperscript{104} CRANE & BARG, supra note 100, at 10. It should be noted that the Perry Preschool program had only about one hundred students enrolled. See supra text accompanying note 102. There is no guarantee that it could work well on as large a scale as that envisioned here. Moreover, times have changed, so even if the program worked in the 1960s, there is no guarantee it would work as well now. See Donohue & Siegelman, supra note 100, at 15 n.36 (urging caution in drawing conclusions about the efficacy of early childhood intervention programs).
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for the MAOA-low genotype and offering early intervention services to families with MAOA-low children, a court should then weigh that public interest against the private interests embodied in each of the aforementioned constitutional guarantees—for example, the private interest in freely exercising one’s religion or directing the education and upbringing of one’s children.

A. First Amendment Right to Free Exercise of Religion

The Supreme Court, in Employment Division, Department of Human Resources of Oregon v. Smith, held that an individual’s religious beliefs do not excuse him from compliance with a “neutral law of general applicability” on the ground that the law requires conduct that his religion prohibits. A law is neutral and generally applicable when it does not aim to “infringe upon or restrict practices because of their religious [character]” or “impose burdens only on conduct motivated by religious belief”—that is, when it has only the incidental effect of burdening a particular religious practice. Such a law is subject to rational basis review: it must serve a legitimate governmental interest and be reasonably calculated to achieve its end.

In addition, in Douglas County v. Anaya, a mother and father brought suit alleging that a Nebraska screening statute that mandated that their infant daughter be screened for various metabolic and genetic disorders violated their First Amendment right to freely practice their religion. The Anayas believed that their daughter’s lifespan would be shortened if blood were drawn from her body. The Nebraska Supreme Court rejected the Anayas’ argument, holding that the screening statute was a neutral law of general applicability because it was “generally applicable to all babies born in the state[,] . . . [did] not discriminate as to which babies must be tested,” and was not “directed at religious practices or beliefs.” Thus the statute was subject to rational basis review and was

104 Id. at 879. Congress responded to the Court’s decision in Smith by voting to pass the Religious Freedom Restoration Act (“RFRA”) of 1993, which asserts that a neutral law of general applicability can burden a religion as much as a law which targets that religion. The Religious Freedom Restoration Act of 1993, 42 U.S.C. §§ 2000bb-2000bb4 (2006). The law attempted to reinstate strict scrutiny review of laws, even neutral ones, claimed to have violated the Free Exercise Clause of the First Amendment. Id. In City of Boerne v. Flores, however, the Court ruled that RFRA was unconstitutional. 521 U.S. 507, 533–35 (1997).
105 San Jose Christian College v. Morgan Hill, 360 F.3d 1024, 1031 (9th Cir. 2004) (citing Church of Lukumi Babalu Aye, Inc. v. City of Haileah, 508 U.S. 520, 545 (1993)).
106 694 N.W.2d 601 (Neb. 2005).
107 Id. at 603.
108 Id. at 604.
109 Id. at 608.
constitutional because there was a rational basis for the law. The court reasoned that Nebraska had a legitimate interest in “the health and welfare of all children born in Nebraska” and in “the potential social burdens created by children . . . not identified and tested” and held that the screening statute was reasonably calculated to safeguard such health and welfare and to prevent such social burdens.

Like the Anayas, parents who have challenged mandatory genetic screening laws under the First Amendment Free Exercise clause have generally objected to the requirement that their child’s blood be drawn. The cell sample to be tested pursuant to the legislation proposed here would be extracted by a cheek swab. It is difficult to imagine that such a minimally invasive procedure could conflict with any religious practice or precept. A court confronted with such a First Amendment free-exercise challenge would first need to determine whether the screening statute is a “neutral law of general applicability.” Because the proposed statute applies to all newborns and does not target specific religious practices or beliefs, it would likely be considered neutral. A court would then subject the legislation to rational basis review. Because the government interest is compelling, let alone legitimate, and the means chosen to effect that interest are reasonable, the legislation should survive a First Amendment free-exercise challenge.

B. Fourteenth Amendment Parental Rights

In Meyer v. Nebraska, the Supreme Court recognized the “natural duty” and right of parents to control their children’s upbringing and direct their children’s education. The Court held that this right may not be interfered with by legislation that is arbitrary or without reasonable relation to some legitimate public purpose. Some twenty years later, in Prince v. Massachusetts, a woman convicted of providing her nine-year-old daughter with religious propaganda to sell on the street to passersby

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113 Id.  
114 Id.  
115 See, e.g., Spiering v. Heineman, 448 F. Supp. 2d 1129, 1132 (D. Neb. 2006) (“The Spierings sincerely believe that subjecting a child to the pain and trauma of a blood draw within seven days of birth violates the religious precept of ‘Silent Birth’ . . .”); Anaya, 694 N.W.2d at 604 (“The Anayas declined to submit [their daughter] for the screening, stating that it was in direct conflict with their sincerely held religious beliefs that life is taken from the body if blood is removed from it.”).  
117 See supra text accompanying notes 79–104.  
118 262 U.S. 390 (1923).  
119 Id. at 399–400.  
120 See also Pierce v. Soc’y of Sisters, 268 U.S. 510, 514 (1925) (holding that a parent’s constitutional right to direct the upbringing and education of his or her children may not be abridged by legislation which has no reasonable relation to some purpose within competency of state).  
121 321 U.S. 158 (1944).
invoked Meyer in support of her argument that Massachusetts had violated her fundamental right to direct the upbringing and education of her children.\textsuperscript{122} The Court acknowledged that “the custody, care and nurture of the child reside first in the parents”\textsuperscript{123} but underscored that the state as parens patriae might regulate the family in the public interest—for example, by circumscribing a parent’s control over his or her children by requiring school attendance or regulating or prohibiting child labor.\textsuperscript{124} The state’s “authority is not nullified merely because the parent grounds his claim to control the child’s course of conduct on religion or conscience.”\textsuperscript{125} The Court cited the vulnerability of children to “impending restraints and dangers” and their importance to the growth and development of democratic society as justifications for the broad authority states exercise over them.\textsuperscript{126}

The Supreme Court has not yet decided that the custody and care of one’s children are among those fundamental rights whose infringement merits strict scrutiny.\textsuperscript{127} Courts reason that applying strict scrutiny to laws that infringe parents’ right to educate and raise their children as they see fit would “tilt the table in favor of the rights of parents and against the safety of children.”\textsuperscript{128} Thus, laws that infringe parents’ right to educate and raise their children as they see fit are subject to rational basis review. As the Court instructed in Meyer, the legislation must bear some reasonable relation to a legitimate public purpose.\textsuperscript{129}

In Spiering v. Heineman, a mother and father brought suit alleging that the same Nebraska screening statute at issue in Anaya violated their Fourteenth Amendment right to direct the custody and care of their children.\textsuperscript{130} The Spierings, Scientologists, believed that subjecting a child to “the pain and trauma” of a blood test within seven days of birth violated the religious precept of “Silent Birth” and could cause the child to suffer physical or mental injury.\textsuperscript{131}

The District Court for the District of Nebraska ruled against the Spierings, holding that the screening statute survived rational basis

\textsuperscript{122} Id. at 165–66.
\textsuperscript{123} Id. at 166.
\textsuperscript{124} Id.
\textsuperscript{125} Id. (internal citations omitted).
\textsuperscript{126} Id. at 168 (“The state’s authority over children’s activities is broader than over like actions of adults . . . . A democratic society rests, for its continuance, upon the healthy, well-rounded growth of young people into full maturity as citizens . . . . It may secure this against impending restraints and dangers.”).
\textsuperscript{129} Meyer v. Nebraska, 262 U.S. 390, 399–400 (1923).
\textsuperscript{130} Spiering, 448 F. Supp. 2d at 1131. The screening statute at issue both here and in Anaya was NEB. REV. STAT. § 71-519 (2009).
\textsuperscript{131} Spiering, 448 F. Supp. 2d at 1132.
review.\textsuperscript{132} The court reiterated the well-established principle that "a state is not without constitutional control over parental discretion in dealing with children when their physical or mental health is jeopardized"\textsuperscript{133} and held that Nebraska had a legitimate interest in safeguarding the health of children and that the newborn screening program was reasonably calculated to achieve the state's interest.\textsuperscript{134}

A court confronted with a Fourteenth Amendment parental-rights challenge would also subject the legislation to rational basis review. While the Fourteenth Amendment does guarantee a parent's right to control the "custody, care and nurture" of his children,\textsuperscript{135} a court will not "tilt the table in favor of the rights of parents and against the safety of children" by applying strict scrutiny.\textsuperscript{136} Thus, again, because the government interest is compelling—a higher burden, even, than the "legitimate" interest that is necessary—and the means chosen to effectuate that interest are reasonable, the legislation should survive a Fourteenth Amendment parental-rights challenge.

C. Fourteenth Amendment Right to Privacy

The Supreme Court first recognized a fundamental right to privacy in \textit{Griswold v. Connecticut}.\textsuperscript{137} Justice Douglas, writing for the Court, asserted that "specific guarantees in the Bill of Rights have penumbras, formed by emanations from those guarantees that help give them life and substance. Various guarantees create zones of privacy."\textsuperscript{138} The cases traditionally regarded as protecting individuals' privacy implicate two different interests: the interest in avoiding disclosure of personal matters and the interest in independence in making important decisions.

1. Avoiding Disclosure of Personal Matters

In \textit{Whalen v. Roe},\textsuperscript{139} the Supreme Court held that a New York statute that required that the names and addresses of patients prescribed opiates and other commonly abused drugs be recorded in a centralized computer database did not "pose a sufficiently grievous threat" to patients' interest in avoiding disclosure of personal matters "to establish a constitutional violation."\textsuperscript{140} Patients and physicians argued that "the mere existence in readily available form of . . . information about patients' use of [the]
drugs” constituted a violation of patients’ right to privacy.\textsuperscript{141} There was a “genuine concern,” they argued, that patients’ use of the drugs would become public and that they would be stigmatized as drug addicts.\textsuperscript{142} The Court acknowledged that public disclosure of information contained in the database could come about in various ways. For instance, the Court noted that Health Department employees could deliberately or negligently fail to maintain proper security.\textsuperscript{143} The Court concluded, however, that the security provisions of the statute were adequate to guard against such contingencies.\textsuperscript{144} The Court underscored that, disclosures of private medical information to doctors, to hospital personnel, to insurance companies, and to public health agencies are often an essential part of modern medical practice even when the disclosure may reflect unfavorably on the character of the patient. Requiring such disclosures to representatives of the State having responsibility for the health of the community, does not automatically amount to an impermissible invasion of privacy.\textsuperscript{145}

The Third Circuit has provided perhaps the most articulate and, arguably, accurate interpretation of Whalen. In United States v. Westinghouse Electric Corp.,\textsuperscript{146} the Third Circuit concluded that the Court in Whalen had established a constitutional right to privacy in medical records—but that the right was not absolute.\textsuperscript{147} A state could gain access to an individual’s medical records if the state advanced a need to acquire the information in order to safeguard the public health, safety, or welfare—that is, if the state were engaged in the “reasonable exercise of its broad police powers.”\textsuperscript{148} The court in Westinghouse pointed out that, in determining whether an intrusion into the “zone of privacy surrounding

\begin{itemize}
\item \textsuperscript{141} Id. at 600 (emphasis added).
\item \textsuperscript{142} Id.
\item \textsuperscript{143} Id.
\item \textsuperscript{144} Id.
\item \textsuperscript{145} Id. at 602.
\item \textsuperscript{146} 638 F.2d 570 (3d Cir. 1980).
\item \textsuperscript{147} Id. at 578. In Westinghouse, the court called attention to the public’s increasing concern over the “governmental accumulation of data and the ability of government officials to put information technology to uses detrimental to individual privacy.” Id. at 576. The court then remarked that public concern was particularly justified where the data to be gathered was an individual’s medical information: “Information about one’s body and state of health [has a special character and] is [a] matter which the individual is . . . entitled to retain within the ‘private enclave where he may lead a private life.’” Id. at 577 (quoting United States v. Grunewald, 233 F.2d 556, 581–82 (2d Cir. 1956) (Frank, J., dissenting)).
\item \textsuperscript{148} Whalen, 429 U.S. at 598; see also Westinghouse, 638 F.2d at 578.
\end{itemize}
medical records” was permissible, courts generally weighed the state’s interest in disclosure against the individual’s privacy interest. Factors that courts considered in balancing the competing interests included

[t]he type of record requested, the information it does or might contain, the potential for harm in any subsequent nonconsensual disclosure, the injury from disclosure to the relationship in which the record was generated, the adequacy of safeguards to prevent unauthorized disclosure, the degree of need for access, and whether there is an express statutory mandate, articulated public policy, or other recognizable public interest militating toward access.

Applying those factors to the case before it, the Third Circuit held that the National Institute of Occupational Safety and Health (“NIOSH”) could access Westinghouse employees’ medical records in order to investigate the effects of a workplace toxin on employees as part of a larger effort to develop national occupational safety and health standards. The court concluded that “the strong public interest in facilitating the research and investigations of NIOSH” justified what was a minimal intrusion into Westinghouse employees’ privacy rights.

It would be inappropriate, here, to suggest that courts use one of the three standards of judicial review—rational basis, intermediate scrutiny, or strict scrutiny—to test government action that is alleged to violate an individual’s right to avoid disclosure of medical records. Rather, courts employ a balancing test—they weigh the state’s interest in disclosure against the individual’s privacy interest, taking into consideration the various factors outlined above. While this balancing resembles rational basis review, to define it as such would be to mischaracterize the approach courts have taken to medical-record disclosure cases. The same is true for Fourth Amendment warrantless search cases, in which courts employ a “special needs” analysis—distinct from any of the three standards of judicial review—to test the disputed government action.

Parents bringing suit on behalf of their newborns will likely argue, as did the patients and physicians in Whalen, that the mere existence in readily available form of information about newborns’ genotype

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149 Westinghouse, 638 F.2d at 578.
150 Id.
151 Id. at 580.
152 Id.
153 Id. at 578.
154 See infra text accompanying notes 177–83.
constitutes a violation of newborns’ right to avoid disclosure of personal matters. Parents will argue that the public disclosure of their child’s genotype could result in social stigmatization, employment discrimination, or insurance discrimination.

The Whalen court was not persuaded by concerns regarding employment and insurance discrimination. While a child who tests positive for the MAOA-low genotype is a risk to employ and, to a lesser extent, a risk to insure, states have taken significant steps to ensure the confidentiality of genetic information. The federal government, too, recognizing the need for regulation regarding insurer and employer access to genetic testing and subsequent treatment, has implemented various measures that safeguard patient privacy rights in an era of genetic screening, including the Americans with Disabilities Act ("ADA"), the Health Insurance Portability and Accountability Act ("HIPAA"), and the Genetic Information Nondiscrimination Act ("GINA").

Courts are more likely to be attentive to concerns that public disclosure of an abnormal test will result in social stigma and personal anguish. These concerns are not new to the arena of genetic testing, but they are perhaps amplified where a state is testing for the MAOA-low genotype. Scholars have expressed doubts that laws can "be used to limit the potentially negative social consequences of labeling" children. Even where states have taken significant precautions to ensure the confidentiality of test results, those results may become available to others, either because of a simple mistake, poor data-handling protocols and

155 Indeed, parents might argue that such a database is a violation of their own right to avoid disclosure of personal matters since information about a newborn’s genetic makeup necessarily imparts information about the parents’ genetic makeup.


159 Genetic Information Nondiscrimination Act of 2008, 42 U.S.C. § 2000ff (Supp. II 2009); Gregory Katz & Stuart O. Schweitzer, Implications of Genetic Testing and Health Policy, 10 Yale J. Health Pol'y L. & Ethics 90, 103-05, 108 (2010). This, of course, ignores the argument that employers and insurers will discriminate in spite of the law. Economist David Friedman argues that where insurers no longer have the option of testing applicants and pricing insurance accordingly, they will charge all customers a high-risk premium. Low-risk—for this Note’s purposes, MAOA-high—individuals will not be able to purchase insurance unless they are willing to pay more than the actuarial value of their risk. MAOA-high buyers could solve the problem by providing guarantees that they are MAOA-high. Those who are MAOA-low will not be able to provide such guarantees and thus the insurer will conclude that they are MAOA-low and either charge them a higher premium or deny them coverage. The same argument applies in the employment context. MAOA-high job applicants will be eager to provide guarantees that they are MAOA high. Those who are MAOA-low will be unable to provide such guarantees and the employer will conclude that they are MAOA-low and not hire them. DAVID D. FRIEDMAN, LAW’S ORDER: WHAT ECONOMICS HAS TO DO WITH LAW AND WHY IT MATTERS 69-73 (2000).

160 Fornal, supra note 94, at 118.
practices, or future legislation. A child who tests positive for the MAOA-low genotype might be labeled a monster—a kind of Mr. Hyde.

There is, then, a danger that the child will internalize that label—that an abnormal test will become a self-fulfilling prophecy. Or if not a self-fulfilling prophecy, a source of considerable self-doubt and mental anguish: “The belief that a negative event is genetically mandated [may] result[] in decreased self-esteem and feelings of hopelessness and depression.”

Despite these significant concerns, a court is not likely to invalidate the proposed legislation. A state’s compelling interest in testing and offering supportive services to MAOA-low children justifies what is a minimal intrusion into newborns’ privacy rights, especially given the significant measures taken to ensure the confidentiality of test results and federal and state legislation in place to ensure that disclosed test results are not misused.

2. Independence in Making Important Decisions

In Roe v. Wade, the Supreme Court recognized a “right of privacy” founded in the Fourteenth Amendment’s concept of personal liberty that was “broad enough to encompass a woman’s decision whether or not to terminate her pregnancy.” And the Court in Cruzan v. Director, Missouri Department of Health held that a person has a constitutionally protected right to refuse unwanted medical treatment. The Court’s decisions affording individuals independence from government interference in making important decisions are restricted to matters relating to marriage, procreation, contraception, family relationships, child rearing, education, and bodily integrity. In Paul v. Davis, for example, the Court denied an individual’s claim for protection against the disclosure of his arrest on a shoplifting charge on the grounds that his claim was not

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161 Id.
162 Stone, supra note 55, at 1566.
163 410 U.S. 113 (1973).
164 Id. at 153; see also Doe v. Bolton, 410 U.S. 179, 185–86 (1973) (holding that Georgia abortion statutes that forced the petitioner “either to relinquish ‘her right to decide when and how many children she will bear’ or to seek an abortion that was illegal . . . invaded her rights of privacy and liberty in matters related to family, marriage, and sex, and deprived her of the right to choose whether to bear children[,] . . . guaranteed her by the . . . Fourteenth Amendment[!”]).
166 Id. at 278.
based upon any challenge to the state’s ability to restrict his freedom of action in a sphere contended to be “private.”

An individual’s right to independence from government interference in making important decisions—even in those spheres contended to be private—is not absolute. In Washington v. Glucksberg, the Court acknowledged that the Fourteenth Amendment guaranteed a fundamental right to refuse unwanted lifesaving medical treatment, but refused to carve out of the Fourteenth Amendment a fundamental “right to die,” or more specifically, a right to physician-assisted suicide. The Court then held that Washington’s assisted-suicide ban was rationally related to a legitimate government interest. Washington had an “unqualified interest in the preservation of human life” as well as an interest in protecting vulnerable groups from “abuse, neglect, and mistakes;” the assisted-suicide ban was “at least reasonably related to their promotion and protection.”

A court confronted with a Fourteenth Amendment privacy-rights challenge to MAOA screening would, where the allegation is that the legislation impairs the claimant’s independence in making important decisions, first determine whether the Fourteenth Amendment guarantees a fundamental right to refuse unwanted genetic testing. As the Supreme Court asserted in Glucksberg, it will not unsparingly carve fundamental rights out of the Fourteenth Amendment. While the Fourteenth Amendment does guarantee a fundamental right to one’s own bodily integrity, it is unlikely that a court would view a cheek swab as an invasion of a newborn’s bodily integrity. In the absence of a fundamental right, the legislation is subject to rational basis review which, as has already been established, it should survive.

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169 Id. at 713.

170 See, e.g., Breithaupt v. Abram, 352 U.S. 432, 439 (1957) (“As against the right of an individual that his person be held inviolable . . . must be set the interests of society . . . .”); Jacobson v. Massachusetts, 197 U.S. 11, 24-30 (1905) (balancing an individual’s liberty interest in declining an unwanted smallpox vaccine against the state’s interest in preventing disease).


172 Id. at 721, 722 n.17, 728.

173 Id. at 735.

174 Id. at 728, 731, 735 (emphasis added) (quoting Cruzan v. Dir., Mo. Dep’t of Health, 497 U.S. 261, 282 (1990)).

175 Glucksberg, 521 U.S. at 727.

176 In Rochin v. California, the Court held that Los Angeles County deputy sheriffs violated a man’s fundamental right to bodily integrity as guaranteed by the Fourteenth Amendment when they grabbed and squeezed him by the neck, shoved their fingers in his mouth, handcuffed him, and brought him to the emergency room. 342 U.S. 165, 172 (1952). In the emergency room, he was then strapped to an operating table and had a tube forcibly placed in his mouth and into his stomach in order to obtain capsules he had swallowed when the deputies had attempted to search his apartment. Id. Justice Frankfurter, writing for the Court, decried the deputies’ behavior as that which “shocks the conscience,” clearly in violation of the claimant’s substantive due process rights. Id.
D. Fourth Amendment Right Against Unlawful Search and Seizure

The “ultimate measure of [the] constitutionality of a governmental search is ‘reasonableness.’”177 In the context of a criminal investigation, reasonableness requires the obtaining of a judicial warrant, which cannot be issued without a showing of probable cause.178 A warrant is not required, however, to establish the reasonableness of all government searches: “[I]n those exceptional circumstances in which special needs, beyond the normal need for law enforcement, make the warrant and probable-cause requirement impracticable, . . . a court [is] entitled to substitute its balancing of interests for that of the Framers.”179

Where the government alleges a “special need” to conduct the warrantless search at issue, courts will engage in a “context-specific inquiry,” balancing the competing public and private interests advanced by the parties.180 On the public side of the weighing scale lies the nature and “immediacy” of the governmental concern at issue, and the efficacy of the government’s means for addressing that concern.181 “Immediacy” means the relative urgency of solving the problem. In Vernonia, for example, the Supreme Court emphasized the fact that the school district, which had enacted a program of random drug testing for all student-athletes, was confronted by a “three-fold increase in classroom disruptions and disciplinary [problems];” and that “disciplinary actions had reached ‘epidemic proportions.’”182 On the private side of the weighing scale lies the nature of the privacy interest upon which the search intrudes and the character of the intrusion complained of.183

The practical application of the “special needs” doctrine is limited to two sets of circumstances: where the government acts to safeguard the public health, welfare, and safety,184 and where the government acts in loco

180 Chandler v. Miller, 520 U.S. 305, 314 (1997). In the absence of a special need, the analysis goes no further. Id.
181 Vernonia, 515 U.S. at 660. The Court in Vernonia pointed out that the government need not demonstrate a “compelling need” to enact the search at issue—that is, if, by “compelling need,” one means a “fixed, minimum quantum of governmental concern.” Rather, the government need only demonstrate an interest important enough to justify the particular search at issue. Id. at 661.
182 Id. at 649.
183 Id. at 654, 658.
184 See, e.g., Nat’l Treasury Emps. Union v. Von Raab, 489 U.S. 656, 666–67 (1989) (holding that the government’s interest in preventing the risk to the life of citizens posed by the potential use of deadly force by U.S. Customs drug interdiction personnel suffering from impaired perception and judgment justifies the use of a warrantless drug-testing program for such personnel); Skinner v. Ry. Labor Executives’ Ass’n, 489 U.S. 602, 633 (1989) (holding that the government’s interest in regulating the conduct of railroad employees engaged in safety-sensitive tasks in order to ensure the safety of the traveling public and of the employees themselves justifies the use of a warrantless drug-
parentis to protect the health and safety of schoolchildren under its supervision.\textsuperscript{185}

In National Treasury Employees Union v. Von Raab,\textsuperscript{186} the Supreme Court held that the government’s substantial interest in deterring drug use among those eligible for promotion to sensitive positions within the United States Customs Service presented a “special need” that justified departure from Fourth Amendment warrant and probable-cause requirements.\textsuperscript{187} The government had implemented a screening program which required a urinalysis test for employees who sought transfer or promotion to positions involving drug interdiction, firearms, or classified material.\textsuperscript{188} The Court asserted that requiring probable cause in the context of routine administrative functions where the government “[sought] to prevent the development of hazardous conditions” was at least impractical.\textsuperscript{189} The government’s screening program was justified because the hazardous conditions the government sought to prevent were substantial—nothing less than “veritable national crisis in law enforcement caused by the smuggling of illicit narcotics”—and the invasion complained of was minimal in light of the diminished expectation of privacy of Customs employees directly involved in the interdiction of drugs.\textsuperscript{190}

testing program); Griffin v. Wisconsin, 483 U.S. 868, 874–75 (1987) (holding that the government’s interest in protecting the community from at-large probationers justifies a program of supervision of probationers that departs from the usual warrant and probable-cause requirements).

\textsuperscript{185} See, e.g., Bd. of Educ. v. Earls, 536 U.S. 822, 838 (2002) (holding that a school district policy requiring students to consent to drug testing in order to participate in extracurricular activities was a reasonable means of furthering the school district’s interest in preventing and deterring drug use among schoolchildren); Vernonia, 515 U.S. at 665 (holding that a school district policy requiring random drug testing of student-athletes was a reasonable means of furthering the school district’s interest in preventing and deterring drug use among schoolchildren); New Jersey v. T.L.O., 469 U.S. 325, 334 (1985) (holding that a school’s interest in maintaining an environment in which learning can take place justifies a school official’s warrantless search of a student who is under the school’s authority).

\textsuperscript{186} 489 U.S. 656 (1989).

\textsuperscript{187} Id. at 666.

\textsuperscript{188} Id. at 660–61.

\textsuperscript{189} Von Raab, 489 U.S. at 668 (emphasis added).

\textsuperscript{190} Id. at 668, 672. Compare this result with the Court’s holding in Skinner that blood and urine tests were unquestionably searches within the meaning of the Fourth Amendment:

In light of our society’s concern for the security of one’s person, it is obvious that this physical intrusion, penetrating beneath the skin, infringes an expectation of privacy that society is prepared to recognize as reasonable. The ensuing chemical analysis of the [blood] sample to obtain physiological data is a further invasion of the tested employee’s privacy interests. . . . It is not disputed . . . that chemical analysis of urine, like that of blood, can reveal a host of private facts about an employee . . . . Nor can it be disputed that the process of collecting a sample to be tested . . . itself implicates privacy interests . . . . [T]hese intrusions must be deemed searches under the Fourth Amendment.

In *Vernonia*, the Court held that, considering the substantial nature of the government need advanced, the “relative unobtrusiveness” of the search effected, and students’ diminished expectation of privacy, random urinalysis drug testing of student-athletes was reasonable within the meaning of the Fourth Amendment and thus constitutional. Justice Scalia, in an opinion that reflected the concerns he voiced in his dissenting opinion in *Von Raab*, highlighted the real, substantial, and pressing nature of the problem alleged by the school district. The Court further emphasized the strict procedures in place to both preserve student-athletes’ privacy and prevent against public disclosure of test results. Finally, the Court discussed at length the diminished expectation of privacy of students:

> [U]nemancipated minors lack some of the most fundamental rights of self-determination . . . . When parents place minor children in . . . schools for their education, the teachers and administrators of those schools stand *in loco parentis* over the children entrusted to them . . . . [T]he nature of that power is custodial and tutelary, permitting a degree of supervision and control that could not be exercised over free adults.

The Supreme Court defined the boundaries of the “special needs” doctrine in *Ferguson v. City of Charleston*. In that case, the Court held that a state hospital could not perform a nonconsensual blood test on pregnant patients in order to obtain evidence of cocaine use for law enforcement purposes. While the government interest in using the threat of criminal sanctions to deter pregnant women from using cocaine was substantial, it was not compelling enough to justify a departure from the Fourth Amendment warrant and probable-cause requirements. The Court reasoned, first, that the invasion of privacy was “far more substantial” than in *Von Raab, Skinner*—discussed below—or *Vernonia*. In those cases, there was “no misunderstanding about the purpose of the

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192 *Von Raab*, 489 U.S. at 680–81 (Scalia, J., dissenting) (“I joined the Court’s opinion [in *Skinner*] because the demonstrated frequency of drug and alcohol use by the targeted class of employees, and the demonstrated connection between such use and grave harm, rendered the search a reasonable means of protecting society. I decline to join the Court’s opinion in the present case because neither frequency of use nor connection to harm is demonstrated or even likely.”); see also *Vernonia*, 515 U.S. at 649.
193 *Vernonia*, 515 U.S. at 650–51.
194 *Id.* at 654–55.
196 *Id.* at 84, 86.
197 *Id.* at 70, 85.
test or its potential use." Second, hospital patients do not have a diminished expectation of privacy as do employees who routinely confront hazardous situations or students in the custody of school officials. Finally, the testing program at issue was not, in fact, divorced from law enforcement purposes, but rather went hand-in-hand with law enforcement. Ultimately, the Court asserted, "the gravity of the threat alone cannot be dispositive of questions concerning what means law enforcement officers may employ to pursue a given purpose."

The MAOA screening legislation proposed herein will obtain a newborn's cell sample by buccal smear which, while not physically intrusive in the ways that a blood test is, constitutes a search within the meaning of the Fourth Amendment. The Supreme Court in *Skinner v. Railway Labor Executives' Ass'n* held that a blood test administered to railroad employees involved in certain train accidents was a search under the Fourth Amendment—first, because it was a "physical intrusion, penetrating beneath the skin," and second, because it was followed by a chemical analysis of the employee’s blood to obtain physiological data. The Ninth Circuit, following *Skinner*, concluded that a buccal smear—an "invasion of the interior of the body" to obtain a subject’s DNA—was a search under the Fourth Amendment. The Tenth and Eleventh Circuits, too, have held that a buccal smear is a search within the meaning of the Fourth Amendment.

The state action here clearly falls within the limited circumstances in which the courts have permitted warrantless searches: the state is acting to safeguard the health, welfare, and safety of its residents and acting *in loco parentis* to protect the health and safety of MAOA-low children, who may suffer serious mental and emotional consequences in the absence of essential support services. Thus a court confronted with a Fourth Amendment challenge to the newborn screening program should subject the legislation to the "special needs" analysis.

As discussed at length above, the problem posed to states by maltreated, MAOA-low males is real and substantial. This bodes well for the proposed legislation under a "special needs" analysis, especially since

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198 Id. at 78.
199 Id.
200 Id. at 86 (quoting Indianapolis v. Edmond, 531 U.S. 32, 42–43 (2000)).
202 Friedman v. Boucher, 580 F.3d 847, 852 (9th Cir. 2009) ("There is no question that the buccal swab constituted a search under the Fourth Amendment."); see also Fuller v. M.G. Jewelry, 950 F.2d 1437, 1449 (holding that the Fourth Amendment protects against "all searches that invade the interior of the body—whether by a needle that punctures the skin or a visual intrusion into a body cavity").
203 Padgett v. Donald, 401 F.3d 1273, 1277 (11th Cir. 2005) (holding that swabbing the inside of the mouth for saliva is a search); Schlicher v. Peters, 103 F.3d 940, 942–43 (10th Cir. 1996) (holding that the collection of saliva is a search).
the population subject to government action is composed of children—over whom the state may exercise a greater degree of supervision and control. The test articulated in Vernonia, however, requires that the state’s urgency in solving the problem by maltreated, MAOA-low males be “immediate.” In Vernonia, this requirement was satisfied because student-athlete drug use was causing a quantifiable—indeed, an “epidemic”—increase in classroom disruptions.

The question of immediacy poses the greatest threat to the proposed MAOA screening legislation. Because the research that asserts a cause-and-effect relationship between MAOA-low, maltreated males and violent crime is relatively new, and because the MAOA-low genotype is not widely screened-for, the body of evidence that supports the connection between the genotype and violent crime is still small. In his dissenting opinion in Von Raab, Justice Scalia demanded that there be a “well-known or demonstrated evil[] . . . with well-known or demonstrated consequences” before the Court permits warrantless bodily searches. He emphasized that absent from the government’s justifications for the warrantless search at issue—“noticeably absent, revealingly absent, and as far as I am concerned dispositively absent—[was] . . . the recitation of even a single instance in which any of the speculated horribles actually occurred.” Perhaps, then, Bradley Waldroup’s case saves the proposed legislation from invalidation. The slaying he committed is an instance in which a “speculated horrible” occurred. Even without the Waldroup killing though, one can reasonably argue that the problem posed to states by maltreated, MAOA-low males is also a kind of epidemic, especially given the devastating tangible and intangible costs of violent crime.

VI. THE CASE AGAINST MANDATORY SERVICES

Mandatory newborn screening for the MAOA-low genotype should survive constitutional scrutiny in large measure because an effective treatment exists—early intervention services—for the antisocial behavior to which the genotype predisposes males. That begs the question: if the treatment is so effective and its objective so important, why not mandate it? Indeed, there is some case law that suggests that a court would uphold legislation mandating that families with MAOA-low children participate in early intervention services. This Part first argues that mandatory programs might be permissible under Wyman v. James. Section VI.B then goes on to show why mandating that an MAOA-low child’s family participate in

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205 Id. at 663.
207 Id. at 683.
early intervention services would not survive constitutional scrutiny.

A. Permissibility of Early Intervention Services Under Wyman

In Wyman, the Supreme Court held that a beneficiary of the program for Aid to Families with Dependent Children (“AFDC”) could not refuse a home visit by an AFDC caseworker without risking the termination of her benefits.209 The beneficiary contended that the home visit was a search, and when not consented to or supported by a warrant, violated her Fourth Amendment right to be free from unreasonable searches and seizures.210 The Court acknowledged that a case involving “a home and some sort of official intrusion into that home” gave rise to an “immediate and natural... concern about Fourth Amendment rights.”211 But the Court concluded that such a “protective attitude” was not justified in this case because the home visit at issue was not a “search” within the meaning of the Fourth Amendment.212 First, the visit’s purpose was primarily rehabilitative. The Court criticized what it perceived as the beneficiary’s attempts to overstate the investigative nature of the visit, arguing that the visit could not be equated with a traditional criminal search.213 Second, the visit was neither forced nor compelled. If the beneficiary were to deny permission, no search would have taken place.214 Even if the visit were a search, the Court continued, it was not unreasonable and thus did not violate the Fourth Amendment.215

The Court gave several reasons in support of its conclusion. The Court noted that the visit was rehabilitative as opposed to investigative;216 that the AFDC caseworker was “not a sleuth” whose purpose was to investigate a crime or apprehend its perpetrator, but rather “a friend to one in need” whose primary concern was the welfare of the beneficiary;217 and, finally, that there was no real “intrusion” into the home.218 The beneficiary was given written notice of the visit well in advance and the caseworker did not

209 Id. at 326.
210 Id. at 313. The Fourth Amendment protects the right of individuals “to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures.” U.S. CONST., amend. IV.
211 Wyman, 400 U.S. at 316.
212 Id. at 317.
213 Id. at 323.
214 Id. at 317.
215 Id. at 318 (“It is unreasonableness which is the Fourth Amendment’s standard.”).
216 Id. at 323. The Court underscored that a home visit was not a criminal investigation—that is, not undertaken in the context of any criminal proceeding. Id. The Court admitted that a crime might be discovered and that criminal prosecution might follow, but dismissed that possibility as “a routine and expected fact of life and a consequence no greater than that which necessarily ensues upon any other discovery by a citizen of criminal conduct.” Id.
217 Id.
218 Id. at 321.
engage in “snooping.”

The government could invoke *Wyman* in defense of legislation mandating early intervention services for MAOA-low children and their families. A home visit by an ongoing service coordinator would be primarily rehabilitative; the ongoing service coordinator would serve more as a friend than sleuth; and there would be no real intrusion into the home. Like families who receive AFDC, families who participate in Part C early intervention services would be given written notice of home visits well in advance.

B. Problems with *Wyman*

However, there is reason to believe the Court would seize an opportunity to overturn *Wyman*. The decision sparked immediate controversy. Justice Marshall, joined by Justice Brennan, penned a vehement dissent, arguing that the decision was inconsistent with the Court’s previous Fourth Amendment jurisprudence—particularly the “unbroken line of cases” which held that, “subject to a few narrowly drawn exceptions, any search without a warrant [was] constitutionally unreasonable.” Justice Marshall also rejected the majority’s depiction of the home visit as a “purely benevolent inspection[,]” stating, “[o]f course, caseworkers seek to be friends, but the point is that they are also required to be sleuths.” Information gathered and transmitted to the state by caseworkers could result in the imposition of civil penalties, including the termination of parental rights, or criminal convictions. Finally, Justice Marshall derided the majority’s apparent conclusion that “valid Fourth Amendment consent [could] be given under the threat of the loss of one’s sole means of support.”

Since then, the case has been the subject of much criticism. A series of decisions in the 1970s and 1980s cast *Wyman* as an outlier, “a decision so poorly reasoned and at odds with allied precedent that its holding must be limited to the narrowest plausible construction.”

Second, the facts in *Wyman* can be distinguished from those under

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219 *Id.* at 21 (“Forcible entry or entry under false pretenses or visiting outside working hours or snooping in the home are forbidden. . . . All this minimizes any ‘burden’ upon the homeowner’s right against unreasonable intrusion.”).

220 *Id.* at 341 (Marshall, J., dissenting).

221 *Id.* at 339.

222 See *id.* at 340 (arguing that appellant James’s case for Fourth Amendment protection is strong because the home visit at issue could result in a criminal conviction).

223 *Id.* at 344.


225 *Id.* at 373.
consideration here. The majority argued that the home visit at issue was not a search within the meaning of the Fourth Amendment. If the beneficiary were to deny the caseworker permission to enter her home, the caseworker could not enter. The beneficiary would risk the termination of her benefits. Marshall’s dissent pointed out the injustice inherent in such a choice; the Court was essentially asking a woman to choose between her fundamental rights and her family’s livelihood.

The facts under consideration here suggest an even uglier choice. Families required to participate in early intervention services would not receive anything in return for their participation—other than various supportive services, of course. Their participation would be mandated by the state for the benefit of the state. What consequence would confront families who refused to allow an ongoing service coordinator to conduct a home visit? One likely possibility would be removal of the child from the home. The state’s position might be characterized as follows: if you have a child with a genotype that predisposes him to violent psychopathy and you are not going to participate in an early intervention program as prescribed by law, the state is not going to assume the risk that the child becomes a violent criminal. Instead, the state is going to remove the child. The court would emphasize the gravity of such a consequence, and would almost undoubtedly invalidate the mandate.

C. Other Reasons Disfavoring Mandatory Services

Beyond the reasons already discussed, there are other good reasons to offer, but not mandate, supportive services. First, families are more likely to participate wholeheartedly in a program when they are not being compelled to do so. Second, states are more likely to fund a program that does not require them to offer services to thirty-three percent of families who have given birth annually.

226 Whether a MAOA-low child should be removed from the home based upon evidence that the child is being maltreated is a complicated question. At least two scholars have suggested that the bar for removal should be set lower for MAOA-low children, reasoning, accurately, that subjecting these children to abuse and neglect would result in greater harm to society and to the children, themselves. See Stone, supra note 55, at 1578; David Wasserman, Is There Value in Identifying Individual Genetic Predispositions to Violence?, 32 J.L. MED. & ETHICS 24, 28 (2004). But removal may do more harm than good for vulnerable MAOA-low children, because the process is more likely to cause psychological harm to an MAOA-low child. See Paul Chill, Burden of Proof Begone: The Pernicious Effect of Emergency Removal in Child Protective Proceedings, 42 FAM. CT. REV. 540, 542 (2004) (explaining that rates of abuse and neglect are higher in foster care than in the general population). Additionally, setting the bar lower for removal of MAOA-low children is likely to “siphon resources and exacerbate problems within an already strained system, leading to other new harms—such as . . . additional missed cases of fatal child maltreatment.” Id.; see also Stone, supra note 55, at 1586. Despite all this, courts may be more likely to remove MAOA-low males from their parents. However, a comprehensive discussion of the consequences of the proposed legislation for the child welfare system is beyond the scope of this Note.
VII. THE COSTS AND BENEFITS OF THE PROGRAM

State legislatures are likely to balk in the face of proposals to dip into already depleted coffers to fund expensive, experimental social programs. The proposed legislation will substantially increase the cost of states’ newborn screening and early intervention programs. However, even a rudimentary cost-benefit analysis demonstrates that, by reducing the percentage of violent crimes committed, the proposed legislation is likely to save states millions of dollars. The remainder of this Part provides such an analysis based on data from the state of Connecticut.

A. The Costs of the Program

A DNA-based test for the MAOA-low genotype currently costs $250.227 Compare that to $39.20—the current cost per newborn of Connecticut’s newborn screening program.228 Experience suggests that the cost of the test would likely decrease substantially in a screening setting,229 perhaps as much as eighty percent, to approximately $40.230

In 2009 there were approximately 40,000 children born in Connecticut. To screen each of these for the MAOA-low genotype would have cost the state of Connecticut $1.6 million—doubling the cost of the state’s newborn screening program. Of these 40,000 children, approximately 6600 were likely MAOA-low.231 And of these 6600 MAOA-low children, approximately 2400 were likely to have suffered maltreatment as defined by Caspi et al. and Foley et al.232

Under the proposed legislation, Connecticut would offer Part C early intervention services to the families of all 6600 MAOA-low children. For the purposes of this analysis, it is assumed that fifty percent of these families will accept. Given that the average cost per child of early intervention services is an estimated $8700 for a year of services,233 and

227 E-mail from Dr. William Bernet, Prof., Dep’t Psychiatry, Vanderbilt University School of Medicine, to author (Nov. 1, 2010, 13:05 EST) (on file with author).
228 GAO REPORT, supra note 56, at 35.
229 E-mail from Dr. William Bernet, supra note 227.
230 In recent years, the cost of a paternity test has decreased by eighty percent—from $450 to approximately $80. GENETIC TESTING LABORATORIES, INC., http://www.gtldna.com (last visited July 8, 2011). Perhaps counter-intuitively, this decrease in cost has been driven primarily by the increase in demand for such tests. Id. A corresponding decrease in the cost of a test for the MAOA-low genotype, reasonable to expect in a screening setting, would see test prices fall from $250 to approximately $40.
231 Six-thousand-six-hundred represents approximately thirty-three percent of all male children born in Connecticut in 2009. Recall that only a negligible percentage of females, less than 2.5%, are affected by the MAOA-low genotype. See supra text accompanying note 69.
232 Caspi et al. found that approximately twelve percent of the male cohort was both maltreated and MAOA-low. See supra text accompanying notes 31, 88.
that Part C provides services for children from birth through age three, the
cost to Connecticut of providing Part C early intervention services to all
accepting families would be approximately $86.1 million for those children
born in 2009.\textsuperscript{234}

The cost to Connecticut of the proposed legislation, then—mandatory
newborn screening for the MAOA-low genotype followed by Part C early
intervention services for those families with children who test positive for
the genotype—would be approximately $87.7 million.

### B. The Costs of Violent Crime

As outlined above, every aggravated assault costs states $145,379;
every rape costs $448,532; and every murder costs $17,252,656.\textsuperscript{235} In
2009, there were 5760 aggravated assaults in Connecticut, 651 rapes, and
107 murders.\textsuperscript{236} Given these figures, the cost of violent crime to
Connecticut in 2009 was approximately $3 billion.

### C. The Benefits of the Program

Recall that of the estimated 6600 MAOA-low children born in
Connecticut in 2009, approximately 2400 will suffer maltreatment. Recall
also, that for the purposes of this analysis, it is assumed that fifty percent of
families with children who test positive for the MAOA-low genotype will
accept services. It is unlikely that the parents of all 2400 MAOA-low
children who are destined to suffer maltreatment will be among the 3300
parents accepting services. Indeed, it is reasonable to conclude that parents
who are likely to maltreat their children are unlikely to accept supportive
services and supervision. This, of course, is one of the drawbacks of
offering and not mandating services.

Because there is no way of knowing exactly how many MAOA-
low/maltreated children will be among those receiving services, this
analysis considers low-end (25%), middle (50%), and high-end (75%)
estimates. The low-end estimate, for example, assumes that of the 3300
families receiving services, 600 of these will have been likely to maltreat
their MAOA-low child.

This analysis also assumes, following Caspi et al., that maltreated,
MAOA-low children account for forty-four percent of violent convictions.

\textsuperscript{234} Connecticut currently spends $53 million on its Part C early intervention program. The federal
government, under the IDEA, offers the state approximately $4 million to offer the entitlement to its
residents. Interview with Linda Goodman, \textit{supra} note 76. It is inaccurate, however, to assume that the
proposed legislation would simply add $86.1 million to Connecticut’s Part C expenditures because,
undoubtedly, some of those children already being served are MAOA-low.

\textsuperscript{235} See \textit{supra} text accompanying note 90.

(last visited Apr. 7, 2011).
If the families of all 2400 MAOA-low children, then, were to accept services, and if services were one-hundred percent effective, one would expect a forty-four percent reduction in violent crime and a corresponding decrease in the costs of violent crime. Table 1 presents a range of estimates of the savings to the state of Connecticut given different levels of program efficacy.

Table 1.
Percent Reduction in Violent Crime, Corresponding Reduction in Costs of Violent Crime, and Savings to Connecticut from Proposed Legislation

<table>
<thead>
<tr>
<th>EIS Acceptance Rate</th>
<th>No. Families with MAOA-Low Maltreated Child Accepting EIS</th>
<th>Percentage of Violent Crime Committed By This Group</th>
<th>EIS Efficacy Ratio</th>
<th>No. Families Successfully Treated</th>
<th>Percentage of Violent Crime Committed By This Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>75%</td>
<td>1800</td>
<td>33%</td>
<td>0%</td>
<td>450</td>
<td>16.5%</td>
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<td></td>
<td></td>
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<td>25%</td>
<td></td>
<td>8.25%</td>
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<tr>
<td>50%</td>
<td>1200</td>
<td>22%</td>
<td>0%</td>
<td>600</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25%</td>
<td></td>
<td>5.5%</td>
</tr>
<tr>
<td>25%</td>
<td>600</td>
<td>11%</td>
<td>0%</td>
<td>300</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>25%</td>
<td></td>
<td>2.75%</td>
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Table 1 (cont’d).

<table>
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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>50%</td>
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<td>$490,942,908</td>
<td>$228,412,591</td>
<td>$87,730,000</td>
<td>$140,682,591</td>
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<td>25%</td>
<td>$2,975,411,564</td>
<td>$245,471,454</td>
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<td>$163,647,636</td>
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<td>($11,592,470)</td>
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<tr>
<td>50%</td>
<td>$2,975,411,564</td>
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<td>$76,137,530</td>
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<td>25%</td>
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<td>$81,823,818</td>
<td>$38,068,765</td>
<td>$87,730,000</td>
<td>($49,661,235)</td>
</tr>
</tbody>
</table>

If, for example, of the 3300 families accepting early intervention services, 1800 (75% of 2400) are those who would likely have mistreated their MAOA-low child, and if the early intervention program is fifty percent effective at preventing the maltreatment that causes MAOA-low
children to become violent offenders, Connecticut would see an estimated 16.5% reduction in the percentage of violent crime. Such a reduction in the percentage of violent crime would save Connecticut approximately $140.7 million. If, however, the program captured fewer of those families likely to mistreat their MAOA-low child—600 (25% of 2,400)—and if the program were only 25% effective, Connecticut would see only an estimated 2.75% reduction in the percentage of violent crime, and the program would cost the state approximately $49.7 million.

This analysis demonstrates that the benefits to the state of enacting the proposed legislation are very closely tied to the ability of the program to capture and serve those families likely to mistreat their MAOA-low child, as well as to the program’s ability to prevent the maltreatment that causes MAOA-low children to become violent offenders.

VIII. CONCLUSION

In science-fiction writer Philip K. Dick’s short story, Minority Report, murders are prevented by the means of three mutants, “precogs,” who can predict the future. This is “precrime”—a system which incarcerates people for murders they will one day commit. It goes without saying that the American constitutional order would reject such a system, despite its legitimate objective. Scientific research on the MAOA gene provides society with the knowledge and tools necessary to achieve that same objective, the prevention of violent crime, without significantly infringing on individuals’ rights. Indeed, this Note proposes more than a means to prevent violent crime—it proposes a possible solution to the problem of prison overcrowding confronting California and eighteen other states as well. An obvious consequence of large-scale crime prevention, after all, is a dramatic decline in states’ prison populations.

Rather than spending billions of dollars on new-prison construction and the other many and varied costs of violent crime, states should add a screening test for the MAOA-low genotype to their newborn screening programs and offer early intervention services to families with children

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237 Connecticut, of course, would not derive this benefit until approximately twenty years after it had invested in the screening/supportive services program and therefore cost-reduction figures have been discounted at 3.9%. See THE WHITE HOUSE OFFICE OF MGMT. & BUDGET, DISCOUNT RATES FOR COST-EFFECTIVENESS, LEASE PURCHASE, & RELATED ANALYSES, http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c (presenting a forecast of nominal discount rates to be used in cost-effectiveness and like analyses).


239 Id. at 72.

who test positive for the genotype. Not only could such a program prevent violent crime and reduce prison populations, but it could also enrich individuals’ lives by providing at-risk children and their families with essential support services.