Genetics and Crime

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Glossary

Behavioral genetics The study of the contribution of genetics to behavior, the identification of genes involved, and the relationship between genes and environment.

DNA profile A series of numbers recording the size of marker sections of DNA at particular points. Markers are repeated short sequences of DNA that vary in length between individuals. DNA profiles for forensic purposes may consist of 10 or more markers plus a sex indicator.

Gene therapy Inserting functioning genes into cells in an attempt to treat a genetic disorder. Gene therapy is still in an experimental stage. The changes made may or may not be passed on to the next generation, depending on whether the reproductive germ cells are involved.

Genotype A person's entire genetic makeup.

Monoamine oxidase A (MAOA) MAOA is a protein involved in regulating the metabolism of serotonin in the brain and thus influencing brain function. Genetic variations associated with high or low levels of MAOA-A activity have been associated with various neurological disorders.

Introduction

Criminal behavior, particularly violent and antisocial behavior, is considered to be a major social problem with complex causes. It is known that a myriad of environmental, social, and psychological factors are associated with increased risk of convictions for this type of criminality. Interrelated factors include poverty, poor housing, high levels of social inequality in society, low educational attainment, poor diet, low self-esteem, and impulsivity. However, committing at least one criminal offense is almost normal for young males, with approximately one-third having a criminal conviction by age 30 in the United Kingdom. Self-report studies report even higher levels of criminality among both men and women. The peak for offending is in the teenage years, and most young people 'grow out of' crime. Programs that focus on early identification of children likely to offend and that provide social and educational interventions and monitoring can claim some success. For example, the Head Start program for children 3–5 years old in the United States has shown success in reducing crime and improving achievement compared with a control group. However, such interventions are time-consuming and require many resources to achieve significant but not dramatic improvements in outcome overall.

Research in behavioral genetics generates both excitement and concern. Could a scientific approach to crime, using our increasing knowledge of genetics, lead eventually to genetic testing, effective treatments, and even cures? Many young people commit crime, but could genetics help to identify and treat the smaller numbers of persistent and serious offenders? Could there at last be an effective approach to the intractable problem of crime? On the other hand, if a strong link were found between genes and certain types of criminal behavior, there would be ethical issues regarding what to do with the information. Is an offender more or less blameworthy if there is a genetic factor in his or her behavior? Could prevention include treating or detaining affected individuals before they commit any crime? If most young people who commit a crime do not go on to be adult criminals, could intervention do more harm than good?

The Social and Political Context

The definition of crime is broad, including diverse behaviors that differ between societies and over time. Laws on the selling, purchase, and use of drugs, alcohol, and weapons vary even within modern Western countries, as does the age of criminal responsibility. The focus of societal concern has been on antisocial and violent behavior that is typical of street crime usually perpetuated by young men. Responses to these types of behavior in the United States and United Kingdom have been increased surveillance and control, especially of 'problem' children and families; a proliferation of CCTV cameras especially in the United Kingdom; increased rates of imprisonment, with continuing ethnic and gender inequalities; and the labeling of once tolerated behavior as antisocial. DNA technology has enabled the establishment of forensic databases that can be searched for matches with crime scene samples. In most of Europe, these databases typically store DNA

profiles of those convicted of more serious offenses and keep them for a limited time. In England and Wales, profiles and samples are retained for anyone aged 10 years or older who is arrested for all but the most minor offenses, even if they are never charged or are charged but acquitted. In December 2008, the European Court of Human Justice ruled on the cases of 'S' and Marper that the retaining of DNA profiles from those who have not been found guilty of a criminal offense breaches their human rights. 'S' was an 11-year-old child when he was charged but later acquitted of an offense, and Marper's case never came to court because the charges were dropped. DNA technology has the potential to provide increased surveillance and control through the use of genetic information.

This article focuses on violent crime and antisocial behavior because these have been the genetic research focus and a major concern for governments. The purpose of surveillance and early intervention programs is, of course, to try to prevent crime by treating its causes. In the United Kingdom, information on children about risk factors for problem behavior is already collected. These factors include frequent moves, lack of family support, social isolation, poor school attendance, being bullied, learning difficulties, living in a high-crime area, and being easily led. The database can be set by local authorities so that a set number of these indicators trigger an alert for further investigation. It is the idea that a scientific approach using genetic information could be a more reliable way to predict and prevent criminal acts that promotes interest in the research.

Much has been written on surveillance and control, developing Foucault's concept of biopower – power over life. In Foucault's words, in the *History of Sexuality*, volume 1, there has been "an explosion of numerous and diverse techniques for achieving the subjugations of bodies and the control of populations." Power is exercised by the State to promote productive and healthy individual bodies and populations. As some types of problem behavior become a concern of genetic medicine, the identification of 'at-risk' individuals and families and surveillance and (therapeutic) interventions can be associated with promoting health rather than as a threat to the human rights of those identified. The ethical and social issues raised by the research are discussed further, but first the evidence for genes associated with criminality is considered.

The Evidence from Behavioral Genetics

Biological explanations of criminal behavior in the pre-genetics era focused on physical characteristics, including the shape of the skull, facial features, and body type. Most famously, or infamously, is the work of Cesare Lombroso (1835–1909), who sought to make the study of crime a science. He documented the physiological characteristics of different types of criminal men and women, claiming particularly that abnormalities of the skull, jaw, and face marked out the degeneration of the born criminal. Although his statistical data and arguments are not considered valid, the idea of the criminal as physically distinct is still a popular theme in fiction.

There are no 'criminal genes' in the sense of genes that cause criminal behavior, but there are genetic factors that make people more likely to engage in criminal behavior, just as there are social and environmental factors that increase the likelihood of criminal behavior. The classic method of studying genetics has been through twin studies. Behavioral outcomes are compared for monozygotic (identical) twins and dizygotic (fraternal) twins and also for twins and siblings raised in different environments from each other through adoption. These models provide an opportunity to separate out the effects of nature (shared genes) from nurture (families and environment in which the children are raised) in order to quantify their relative influences. Monozygotic twins raised together share 100% of their genes and, it might be assumed, 100% of their environment, whereas dizygotic twins in the same family share 100% of their environment but only the same percentage of genes as that of ordinary siblings. Within a family, if monozygotic twins are more alike for a behavioral trait than are fraternal twins, then a genetic component to that trait is indicated. Where twins are raised separately, a genetic component is indicated where monozygotic twins are more similar for the trait than the dizygotic twins. These studies depend on the assumption that environments are the same for both types of twins if raised together and different for those raised apart. However, it has been argued that twins who look identical are likely to be treated in a more similar way by parents and others and that the bond between them may be particularly strong. A riposte to this from some geneticists is that monozygotic twins have a more similar shared environment for genetic reasons – that is, they may choose more similar environments because of genetic traits, which they share. This is a difficult assertion to test. A further complication is that twins may be thought to be identical by parents because of the children's appearance but in fact are not. Regarding the assumption of different environments, there is evidence that when twins are adopted separately, they tend to be placed in similar environments to each other – for example, perhaps with other family members living in the same area or with adoptive parents of the same socioeconomic status. 'Environment' includes many influences on behavior, from parenting to diet, so that in practice studies have to select, define, and measure particular aspects of the environment that they regard as important to the

trait being studied. Different studies will tend to use different measures.

With these caveats in mind, we consider the estimates of heritability of criminal behavior – that is, estimates of the extent to which genetics can explain the variation in a particular behavior that can be seen within the population. Meta-analyses of twin studies of criminal behavior find that for violent crime, hereditability estimates range from 0 (no influence) to 0.5, where complete hereditability would be 1. The higher figure is for studies that cover a range of violent behaviors, a longer time period, and use self-report studies rather than simply convictions. Studies of twins and families cannot, of course, identify which genes are involved in behavior; for this, molecular analysis is required.

A famous study that appeared to find a genetic trait linked to behavior was that of a Dutch family by Brunner et al. in which generations of males had had low-normal IQ and abnormal violent behavior, including impulsive aggression, arson, and rape. A female member of the family asked for genetic counseling and produced a family tree showing 14 affected males in four generations. Women were not affected. Five of the affected men were tested and found to have no monoamine oxidase A (MAOA) function. MAOA is a mitochondrial enzyme (passed on by the mother) responsible for the breakdown of several neurotransmitters, including dopamine and serotonin, which affect brain function. However, a complete lack of MAOA function is extremely rare and could not be an explanation for aggressive behavior in general. It would therefore seem premature to apply evidence from this study to individuals and attempt to use it in a criminal case. Stephen Mobley's defense team used the study in a mitigation plea and argued that their client should be tested for MAOA function (**Box 1**).

Box 1 The Stephen Mobley Case

Stephen Mobley, age 25 years from Georgia, was accused of murder. In 1991, he entered a Domino's Pizza parlor in Oakwood, Georgia, emptied the till, and shot the manager in the back of the head when he cried. He confessed nearly a month later. He was reported to have the word 'Domino' tattooed on his back, bragged about the killing to friends, and did not show any remorse. Four generations of his family were said to be divided between successful businessmen and violent sociopaths (displaying socially abnormal behavior). Drawing on Brunner et al.'s published research on a Dutch family, Mobley's lawyer tried to use his family background as mitigating evidence to argue for a life sentence rather than the death penalty. Unlike the males in the Dutch family study, Mobley had a normal IQ. His lawyer was reported to have said "we're not arguing that genes made him do it" but if violent behavior is genetic, then it is probably treatable and the judge should know that. The judge refused to agree to genetic testing to determine if the same MAOA deficiency found in the Dutch family was present. Mobley remained on death row until his execution on March 1, 2005.

Gene–Environment Interaction

Research based on longitudinal data collected in New Zealand for the Dunedin study considered a known environmental factor in later antisocial behavior, maltreatment in childhood, and a genetic factor, MAOA expression. Antisocial behavior was assessed by four different measures: a psychological assessment at age 26 years, police convictions for violence, information on the symptoms of antisocial behavior from a person who the subject identified as knowing him well, and an assessment for adolescent conduct disorder. Researchers found a higher incidence of adult antisocial behavior in men with low-activity MAOA genotype who had experienced maltreatment in childhood. These men comprised 12% of the cohort but were responsible for 44% of the convictions for violence. A total of 85% of those with the genetic and environmental indicator developed some form of antisocial behavior. Those who were not maltreated were unlikely to display adult antisocial behavior. For the group who suffered maltreatment as children but had high levels of MAOA functioning, the authors argued that MAOA had a protective effect making them less likely to display antisocial behavior later in life. Low-activity MAOA is common in the population as a whole so that it is unlikely that having the genotype increased the likelihood of a child being mistreated (**Figure 1**).

The correlations found in the study by Caspi et al. and subsequent studies do not indicate what biological processes are involved nor point to any particular solutions. The original research concluded with the suggestion of pharmacological interventions; more recent research suggests that social support can protect even children with the gene and environment combination. It is clearly undesirable for any children to be maltreated, whether or not they have the MAOA genotype, but it is conceivable that social welfare services might consider a gene test as a piece of additional information that indicates heightened risk and, in combination with other risk factors, triggers intervention.

Nature and Nurture

In a meta-analysis of studies replicating the Caspi et al. study, Kim-Cohen et al. present a model of nature and nurture in which "an adverse experience touches off an otherwise 'silent' genetic vulnerability" (2006: 911).

Anderson expresses the view that studies on the interaction between child abuse and antisocial behavior "illustrate beautifully the relationship between the environment and genetics. The genes provide the basic framework, but how the person will grow up depends on

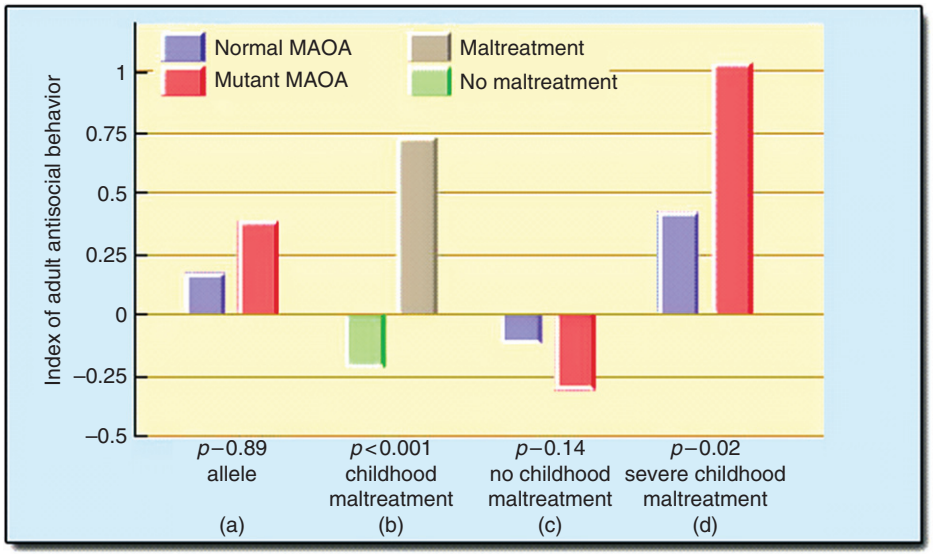

Figure 1 Histogram showing the effects of the normal and mutant MAOA alleles and the extent of childhood maltreatment on adult antisocial behavior. Reproduced with permission from The Open University.

the environment working with the genes" (Anderson, 2007: 194).

Rather than trying to separate out nature and nurture, as in the classic twin and family studies, the new orthodoxy is that the nature–nurture debate is redundant because both nature and nurture affect behavior through complex and not fully understood interactions. However, in the previous quotation from a forensic scientist, it is genes that are fundamental. In this model, nurture can only allow or limit the potential that is in the genes. This seems to make human beings more genetically than environmentally determined, but as Susan Oyama notes, it could equally be said that "an organism's environmental potential is limited because its genes can operate only within the limits imposed by their surroundings; it's true but of course one does not say it" (Oyama, 2000: 38). Although the orthodoxy is that the nature–nurture debate is now declared to be redundant, geneticists and psychologists studying behavior still divide properties into genetic and nongenetic. Oyama rejects the idea of an environmental 'outside' and an inherited 'inside,' and she puts forward an alternative developmental systems theory. She argues that the metaphors of DNA as a blueprint, a map, and genes as instruction manuals are not helpful when trying to understand behavior; they carry assumptions about inevitability, unchangeability, and naturalness. Instead, organisms and their environments develop and evolve together; nurture is an integral part of nature, and aspects of both can be inherited and affects evolutionary processes. The perspective taken on nature and nurture affects the debate on criminal genes not only in the media but also among politicians and policymakers. This is discussed in depth later.

Women

A simple genetic measure that correlates with criminal behavior is having a Y chromosome and therefore being male. The incidence of recorded offenses for antisocial and aggressive behavior is universally lower among girls and women. In the Dutch family, only males were affected, and in the Caspi et al. study, only males were included because there were insufficient numbers of females with the combination of low levels of MAOA and severe maltreatment in childhood. In their book, 'Sex differences and antisocial behaviour', Moffitt et al. used the same data as Caspi et al. They found that neurodevelopmental problems resulting in severe antisocial behaviour that persists into adulthood, have a low prevalence and mainly affect males. The much more common form of antisocial behavior affects males and females, and the authors argue that rather than searching for something that makes females different from males, it is fruitful to consider the social context.

How Genetic Information Could Be Obtained and Used

Behind the appeal of a scientific approach to crime is (and always has been) the idea that it will yield precise, accurate explanations, which will enable solutions to be found. If some forms of criminal behavior could be shown to have a biological basis, then they might be treatable like a disease. The reputation of behavioral genetics is, in many people's minds, tarnished by association with the eugenics (good birth) movement that attempted to improve the human race through breeding. The aim was to prevent

those with 'inferior' genes from breeding, rather than treating them, and encouraging the fit to reproduce. Eugenic policies have reproduced existing racist views and prejudices against homosexuals, gypsies, and the mentally ill. Current researchers and policymakers distance themselves from eugenic solutions and advocate measures such as voluntary genetic testing and social interventions. Genetic information fits in with the current emphasis in youth crime on developing predictive tools and managing the identified risks. The Nuffield Council on Bioethics concludes that although using genetic information to predict future antisocial behavior is not warranted because of its unreliability, it might be justified to use it with other information about risk as long as the aim is to benefit the person and thus benefit society (2002: xxxii). It is easy to envision genetic information forming another indicator of risk in databases on children, but in the case of violent and antisocial behavior there may be a clash between benefiting the individual and benefiting society.

A report from the Institute for Public Policy Research presents a benign view of gene testing for increased risk of criminal behavior. Testing would be voluntary, and any intervention would be designed to help the affected families. The following quotation summarizes the approach taken in the report:

> Behavioral genetic knowledge has the potential to increase government's ability to personalize services and how we decide to allow or restrict use of the information it provides is crucial. The key concerns are that *individuals remain free to choose whether or not they provide this information and suffer no discrimination or disadvantage from withholding their genetic information, and that any use of genetic information is equal and equitable* – advances in behavioral genetics should not benefit one group in society more than another. (Dixon, 2005: 15, emphasis in original)

These are indeed key concerns that would not be easy to guarantee. Although test results for a health-related genetic condition may be a matter for individuals and families, information about a genetic condition that, in certain environments, would increase the risk of an individual engaging in persistent antisocial and violent behavior concerns society as a whole. The report mentions the dangers of eugenics but only asks whether parents might select their children's personalities by embryo selection or termination. Similarly, the danger of a genetic divide is raised in the sense that the better off would be able to have more behavioral tests when available. A different way of considering these two dangers would be an attempt to control reproduction of those with particular genetic traits and families with problem behavior, by encouraging them to have genetic testing with the promise of help but the danger of stigmatization.

We can imagine a benign model of outcomes for those identified as 'at risk' of violent and antisocial behavior through genetic testing:

- Genetic testing and information on its value and limitations is available.
- Parents are free to choose or reject genetic testing.
- A positive test helps to explain problem behavior.
- A medical model, in which the test reveals a health problem, removes blame.
- Personalized interventions are available to help the child and family.
- The parent (and child, depending on age) chooses interventions in discussion with professionals.
- There is no discrimination or disadvantage from withholding genetic information.
- There is no stigmatization (e.g., in education or employment) of the affected person or family.

The problem with this model is that violent and antisocial behavior inevitably affects not only the individual and family but also other people. Citizens expect that society will protect them from those who pose a danger, and they blame the authorities when risky individuals commit a violent offense and have not been effectively treated (e.g., for mental health problems) or identified (e.g., sex offenders moving into an area).

A more negative scenario would be one in which an individual identified as 'at risk' would be subject to the following:

- Lifelong surveillance
- Relatives subject to genetic testing (with consent?)
- Interventions – social, pharmacological, educational, environmental interventions (consent?)
- Additional responsibilities and costs
- An inescapable categorization
- Stigma and effect on life chances (e.g., employment opportunities)

In reality, the consequences for individuals and families could be both positive and negative and be affected by other factors, such as their socioeconomic status, ethnic group, and the health and welfare systems where they live.

In the United States, Campbell and Ross studied genetic testing for behavior by interviewing health professionals and holding focus groups with parents. Parents were more enthusiastic generally than health professionals, but black groups were more concerned and raised issues of inequalities and racism. A concern raised only by the group of black mothers was that young black males would be tested first. Health professionals focused on medical aspects of, and medical solutions to, behavioral problems. Environmental solutions were ignored, seen as unachievable, or considered to be undesirable (i.e., professionals and parents might behave differently toward the child and so unwittingly invoke the violent

behavior rather than prevent it). Health professionals were concerned about labeling and stigmatizing children through the use of genetic tests, and most (19/21) would not want to test their own children even if they displayed symptoms. In contrast, the parents did not medicalize behavior but emphasized the importance of the environment and the possibility of environmental solutions. Nevertheless, they also acknowledged genetic factors in problem behavior and the possible value of a genetic test in helping parents to understand their child's behavior.

There is the possibility that gene therapy could cure a genetic condition in an individual, only, or, more controversially the altered DNA could be passed on to the next generation. Gene therapy has been attempted for some serious genetic diseases that are single-gene disorders, but it is still in an experimental stage. The idea that it could be an effective treatment for a multifactorial condition or that it should be attempted for behavior that is not life threatening to the affected individual is practically and ethically problematic. Environmental interventions could also raise ethical issues if they were difficult to reverse, had to be undertaken with young children, and could lead to labeling and stigma of individuals who have not committed any crime and their families.

A project on 'criminal genes and public policy' by Mairi Levitt and Elisa Pieri held focus group discussions with professionals involved with problem families and offenders. The social workers, probation officers, and those in the legal profession generally saw the causes of criminal behavior as extremely complex. The interaction of social, political, environmental, psychological, and biological factors meant that there were no simple solutions targeted at one particular set of factors. Some professionals could see the possibility of genetic information being used as an additional risk factor when decisions about child protection need to be made or by defense lawyers pleading for their clients. Women might use a gene test result to try to prevent an estranged partner from having access to their children, and the police might be more suspicious of someone with a positive test result who was at the scene of a crime. They saw dangers that this type of genetic information would be used to stigmatize already stigmatized groups by concentrating on street crime rather than, for example, white-collar crime.

Responsibility and Justice

The mantra of behavioral genetics is that genetic influences should not be thought of as immutable nor environmental influences as easier to change. At most, a genetic trait could predispose someone to a particular type of behavior, but it would never make that behavior inevitable under any environmental conditions. Responsibility for actions hinges on the individual having some degree of freedom and facility to consider different possible actions, to choose one, and to act on that choice. In the area of genes and crime, the question is therefore whether genetic influences affect behavior in a different, more determining and immutable way than do environmental influences. How might genetic information affect notions of responsibility for actions and justice?

Peter van Inwagen provides a thought experiment about two (isolated and stable) populations in which rape is, respectively, common (population A) and rare (population B). A genetic explanation is supported when male babies born in each society are secretly exchanged at birth, and as the boys grow up the two societies begin to change, with the incidence of rape falling in A and rising in B. This finding is replicated in other societies in which rape is less common than in A. He then asks,

> To what extent would the facts I have imagined ... provide the rapists who belong to population A with an excuse for their crimes? Should we ... in writing our criminal code be 'population blind'? Would it be fair to write laws that prescribed the same criminal penalties for anyone convicted of (a certain type of) rape, when we know that the proportion of the members of population A who commit rape is, because of the genetic makeup of that population, significantly higher than the proportion [in] most other populations who commit rape? Do the members of A deserve to be treated the same way under the law as members of (for example) B? (Inwagen in Wasserman and Wachbroit, 2001: 228)

In Inwagen's scenario, there is no information on which genes might be involved, and he adds the rider that if the genetic basis was found and could be identified in individuals by a reliable test, then it could be a factor to be brought up in a criminal trial. However, the issue in the scenario is whether being a member of that population should provide an excuse, affect the law, etc. His answer is that it should not. First, there are those in population A who do not commit rape; it is not inevitable. As long as the individual has a choice – he is not unable to refrain from rape – then Inwagen argues that there should be no difference between the way rapists are treated in each society and no mitigating pleas allowed on the grounds of being brought up in society A.

The view that genetic factors should not be treated differently from environmental factors in the criminal justice system is supported by other philosophers and genetic researchers. The argument may be that free will is compatible with genetic and environmental factors or that moral responsibility for actions does not depend on free will. Human dignity, the idea that humans have an intrinsic right to respect, is a controversial concept in bioethics. The Nuffield Council report links it to responsibility and argues that

> a person [is one] whose actions, thoughts, and concerns are worthy of intrinsic respect, because they have been chosen. Organized and guided in a way which makes sense from a distinctively individual point of view. If it turns out to be an illusion that people are responsible for themselves . . . one of the lost fundamental reason which people have for treating each other as worthy of respect would have been undermined. (Nuffield Council on Bioethics, 2002: 121)

Although genetic determinism can be dismissed in the case of behavior, there is the possibility that genetic factors might influence the capacity for choice and the choices made. However, as long as the person can be said to have engaged in rational deliberations before choosing, then that is enough to say the person has acted from his or her own free will (Nuffield Council on Bioethics, 2002: 125). This view would be undermined only if natural science could eventually explain all aspects of human life, including reason, decision making, and free will. It is possible to envisage particular cases in which a genetic influence could in practice remove choice, but that does not undermine general notions of responsibility. The Nuffield report concludes that reliable information about a genetic factor affecting behavior backed up by a test result might be relevant in sentencing offenders, in the same way as environmental, social, and psychiatric evidence may be taken into account. The capacity to have done otherwise is seen as crucial, but there is a recognition that some will find it more difficult to 'do otherwise' than others, and genetic test results may join the list of other mitigating factors. In English law, pleas of diminished responsibility are allowed for psychiatric disorders.

The Future

The key question is whether it would make "any useful difference in daily life to think about the source of inherited behavior in terms of genetics as opposed to environment" (Condit et al. cited in Parens et al., 2006: 301). An understanding of the causes of even a specific genetic disease does not necessarily lead to an ability to cure it. The genetic basis of Huntington's disease has been known since 1993, but this has not yet led to effective treatment or a cure. This is a disease that can usually be unambiguously identified with a genetic test rather than a set of behaviors that are defined as problems depending on the social, environmental, and cultural context.

Currently, there is caution in Western countries about the applications of behavioral genetic research, but this may not necessarily be the case over time or in other cultures. Behavioral genetics could be embraced as a solution to social problems, and concern could shift from individual choice and consent to societal need to reduce problem behaviors. Identifying criminals before they have committed a crime raises issues of human rights, but potentially violent criminals are likely to generate less public and media concern than other groups. The case could be made that serious crimes had been prevented through pre-crime identification of risky individuals. If there are a small number of cases and if those affected are predominantly from the relatively powerless groups, then this approach would be more likely to succeed; hence the concerns in the Campbell and Ross study in Chicago about 'who would be the first to be tested' in a country in which one in nine black men between the ages of 20 and 34 years is in prison. The social and cultural context is crucial to the effects of genes and crime research.

Part of the attraction of a scientific approach to problem behavior is that there could be a quick pharmacological or technological fix. Children at greater than average risk of offending behavior can already be identified, but 'treatments' to mitigate increased environmental and social risk require considerable investment in time and money and have to be maintained over a long period. Where environmental factors are identified, these become the responsibility of society and public authorities. Where genetic factors are identified, these could be seen as an individual problem.

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See also: Multidisciplinary Approaches to Ethics; Nature Versus Nurture; Neuroethics/Brain Imaging; Preimplantation Genetic Diagnosis; Public Engagement in Science and Technology; Responsibility.

Further Reading

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Relevant Website

http://www.ornl.gov/sci/techresources/Human_Genome/elsi/behavior.shtml – U.S. Department of Energy Office of Science, 'Human Genome Project Information.'

Biographical Sketch

Mairi Levitt is Senior Lecturer in the Department of Politics, Philosophy and Religion at the University of Lancaster. She has a background in social science and religious studies, and since 1993 she has engaged in multidisciplinary research on the ethical and social implications of genetic and medical technologies. Her research projects, in different substantive areas, have involved public engagement work with general publics, young people, and stakeholders and a critical perspective on the way health policy and information is communicated. Recent research projects have focused on children on the UK's National DNA Database, 'criminal genes' and public policy, young people's ideas on human enhancement, and perspectives on the roles of nature and nurture in making us who we are.