THE EFFECTS OF DNA EVIDENCE ON THE CRIMINAL
JUSTICE PROCESS

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Confidential Appendix

With the approval of the Dean, Graduate Studies, five brief confidential interviews have been removed from the thesis. The author conducted these interviews with investigating police officers in relation to cases where DNA evidence was produced in court, but an acquittal nevertheless resulted. The interviews were removed from the following pages: 104, 127 and 151-2.
ABSTRACT

This research examines the effects of forensic deoxyribonucleic acid (DNA) evidence on decisions in the courts and on the conduct of criminal investigations. To assess effects on court decisions, quantitative analyses were conducted using primary data from the State of Queensland. A control-comparison method was used to assess the effects in court, and this was made within a context of other evidentiary and extra-legal factors that had a bearing on case outcomes. These other factors included defendant confessions, independent witness testimony and fingerprint and photographic evidence. A sample of 750 cases referred by police for prosecution and finalised past the appeal stage in court, was selected for examination. Half of these cases utilised DNA evidence, while the other half, as a control group, did not. Cases were selected in four categories: sexual offences, serious assaults, homicides and property crime. Data on the cases were analysed using advanced statistical methods and predictor models were developed to demonstrate how, given case configurations, the addition of DNA evidence could potentially alter court outcomes.

Results for the three serious offence types were that DNA evidence emerged as a positive predictor that prosecutors would pursue cases in court, and it demonstrated a powerful influence on jury decisions to convict. Incriminating DNA evidence demonstrated no significant effect on inducing guilty pleas from defendants for serious crimes against the person. However, it did correlate significantly to cases reaching court and to guilty pleas being entered for property offence cases.

The analysis of the effects on investigations relies on data from jurisdictions other than Queensland. Secondary data and the literature were used to assess the potential for strategically using forensic intelligence, along with dedicated investigative resources, to reduce property crimes like burglaries and car thefts. In the one study available that employed adequate research methods, three patrol areas in New South Wales, where a police operation was trialled, were compared to other areas that acted as a control. The police operation aimed at 100% attendance at property crime scenes, the use of intelligence from DNA and fingerprint identifications and
specialised investigative resources to reduce crime levels. While the operation failed to achieve its goal, it did provide some valuable lessons.

The effectiveness of the national criminal DNA database in the UK, reputed to lead the world, was then evaluated in relation to domestic burglaries. Its Australian CrimTrac counterpart did not commence operations until March 2003, and by 2004 was not operating at maximum capacity. Because no published studies were located that measured any effects of the UK database on crime levels, the criterion selected to measure performance was the proportion of convictions achieved through the database to reported crime. For domestic burglaries, this ratio was calculated from secondary official data to be close to one percent (0.01), a figure that included the additional convictions achieved through the intelligence that the database provided.

The research also examined forensic DNA in relation to issues of privacy and civil liberties. Privacy issues are discussed beginning with an historical background to the use and misuse of genetic data. This includes the searches for a “criminal gene” and for genetic links to criminal behaviour. DNA databases are contrasted with databanks, and it is questioned, since we leave our DNA wherever we go, whether it really is private. Civil liberties issues that are discussed include whether providing DNA is a form of self-incrimination; how DNA has helped exonerate the convicted innocent; wrongful convictions based on flawed DNA evidence; whether occasional “mass screenings” with DNA are a reversal of the onus of proof; concerns with DNA databases and “function creep”, and the planting or “forgery” of DNA evidence including the use of amplicon contamination.

In the final chapter, a balance is sought between on one hand, the goal of police and government to provide a safe society, and on the other, the rights to privacy and civil liberties expected by individuals in Western liberal democracies. The chapter addresses the issues of concern raised in the earlier chapter about privacy and civil liberties, and makes recommendations on how these may be resolved. The general approach favoured is to increase police powers in specific situations, but to couple these with the protection of individual rights through greater regulation of those powers. The research also developed a case prioritising system aimed at helping clear laboratory backlogs.
DECLARATION

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

________________________________________

Michael Gerard Briody (25 November 2004)
# GLOSSARY OF ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACPO</td>
<td>Association of Chief Police Officers (UK)</td>
</tr>
<tr>
<td>AFIS</td>
<td>Automated Fingerprint Identification System</td>
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<tr>
<td>AIC</td>
<td>Australian Institute of Criminology</td>
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<tr>
<td>ANZFSS</td>
<td>Australia and New Zealand Forensic Science Society</td>
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<tr>
<td>ATSI</td>
<td>Aboriginal or Torres Strait Islander</td>
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<tr>
<td>B. &amp; E.</td>
<td>Break and Enter (Burglary) Offence</td>
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<td>BES</td>
<td>Break, Enter and Steal</td>
</tr>
<tr>
<td>BOCSAR</td>
<td>Bureau of Crime Statistics and Research (NSW)</td>
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<tr>
<td>CJ</td>
<td>Criminal Justice</td>
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<tr>
<td>CJC</td>
<td>Criminal Justice Commission (Queensland)</td>
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<tr>
<td>CMC</td>
<td>Crime and Misconduct Commission (Queensland)</td>
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<tr>
<td>CODIS</td>
<td>Combined DNA index System (of the FBI)</td>
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<tr>
<td>CRISP</td>
<td>Crime Recording Information System for Police (Qld.)</td>
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<tr>
<td>DNA</td>
<td>Deoxyribonucleic Acid</td>
</tr>
<tr>
<td>DPP</td>
<td>Office of the Director of Public Prosecutions, Queensland</td>
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<tr>
<td>ESR</td>
<td>Environmental Science and Research Limited (NZ)</td>
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<tr>
<td>FBI</td>
<td>Federal Bureau of Investigation (United States)</td>
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<tr>
<td>FLINTS</td>
<td>Forensic-led Intelligence Systems</td>
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<tr>
<td>FSS</td>
<td>Forensic Science Service (UK)</td>
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<tr>
<td>HMSO</td>
<td>Her Majesty’s Stationery Office (London, UK)</td>
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<tr>
<td>ICAC</td>
<td>Independent Commission against Corruption (NSW)</td>
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<td>LAC</td>
<td>Local Area Command, NSW Police</td>
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<tr>
<td>LCN</td>
<td>Low Copy Number (DNA)</td>
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<td>MtDNA</td>
<td>Mitochondrial DNA</td>
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<td>MSO</td>
<td>Most Serious Offence type</td>
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<td>MVT</td>
<td>Motor Vehicle Theft</td>
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<td>NAFIS</td>
<td>National Automated Fingerprint Identification System</td>
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<td>NATA</td>
<td>National Association of Testing Authorities, Australia</td>
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<td>NCIDDD</td>
<td>National Criminal Investigation DNA Database (Aust.)</td>
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<tr>
<td>NDNADB</td>
<td>National DNA Database (UK)</td>
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<tr>
<td>NETO</td>
<td>No evidence to offer (in Magistrates Courts)</td>
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<tr>
<td>NIFS</td>
<td>National Institute of Forensic Science (Australia)</td>
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<td>NIJ</td>
<td>National Institute of Justice, US Department of Justice</td>
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<td>OFPC</td>
<td>Office of the Federal Privacy Commissioner</td>
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<tr>
<td>OIC</td>
<td>Officer in Charge</td>
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<td>OMCG</td>
<td>Outlaw Motorcycle Gang</td>
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<td>OVPC</td>
<td>Office of the Victorian Privacy Commissioner</td>
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<td>p</td>
<td>Probability</td>
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<td>PAL</td>
<td>Police Assistance Line (NSW)</td>
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<tr>
<td>PCR</td>
<td>Polymerase Chain Reaction</td>
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<tr>
<td>PIC</td>
<td>Police Information Centre (of the QPS)</td>
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<td>PPRA</td>
<td>Police Powers and Responsibilities Act, 2000 (Queensland)</td>
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<tr>
<td>QHSS</td>
<td>Queensland Health Scientific Services</td>
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<td>QPS</td>
<td>Queensland Police Service</td>
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<td>RCMP</td>
<td>Royal Canadian Mounted Police</td>
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<td>RFLP</td>
<td>Restriction Fragment Length Polymorphism</td>
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<td>RSMV</td>
<td>Recovered Stolen Motor Vehicle</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>SCAG</td>
<td>Standing Committee of Attorneys-General (Aust.)</td>
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<tr>
<td>S.E.</td>
<td>Standard Error</td>
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<tr>
<td>Sig.</td>
<td>Significance</td>
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<tr>
<td>SOC</td>
<td>Scene(s) of Crime</td>
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<td>SOCO</td>
<td>Scenes of Crime Officer</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
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<tr>
<td>STR</td>
<td>Short tandem repeats</td>
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<tr>
<td>STRP</td>
<td>Short Tandem Repeat Polymorphisms</td>
</tr>
<tr>
<td>TWGDAM</td>
<td>Technical Working Group on DNA Analysis Methods (US)</td>
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<tr>
<td>UUMV</td>
<td>Unlawful Use of Motor Vehicle</td>
</tr>
<tr>
<td>VNTR</td>
<td>Variable number of tandem repeats</td>
</tr>
<tr>
<td>VPLRC</td>
<td>Victorian Parliament Law Reform Committee</td>
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Chapter 5. In both instances, the referees’ comments and suggestions were extremely discerning and contributed towards enhancing the quality of this thesis. To the staff of the National Institute of Forensic Science for publication of my article, “The Effects of DNA Evidence on Arrests and Investigations in Sexual Offence Cases”, in NIFS Forensic Bulletin, June 2002: pp.24-5. That article summarised results from a pilot study for this thesis.

To my wife, best friend and partner, Jacquelene, my deepest appreciation for her unfailing emotional support, and for her willingness to explain some more intricate features of MS Word and Excel.

To my mother Veronica for her support and my teenage sons Matthew and James for their patience. Also to my four grandchildren who arrived on the planet while the research was in progress. For them and their parents, I hope forensic DNA can make for safer living.

Genesis of this research: An article I read in Nature magazine in 1997, to which my nephew Dr Dominic Lunn drew my attention, “DNA fingerprints from fingerprints”, sparked my selection of this thesis topic. At the time I was conducting forensic examinations, and as a fingerprint expert was interested in novel or complementary crime scene examination techniques. I had always found the tale of Watson and Crick’s unravelling of the double helix structure of DNA intriguing, and had been interested in the forensic application of DNA after reading a 1991 article in the FBI Bulletin. The Nature article prompted me to ask, “How effective could trace DNA be in criminal cases?” This thesis attempts to answer that question.
DEDICATION

This thesis is dedicated to the memories of my father, Dr Pat Briody, Order of Australia, and my younger sister, Majella, both of whom passed away during the course of this research.
PART A – BACKGROUND
SYNOPSIS OF PART A

Part A consists of Chapters 1 to 3 and sets the background to the primary research undertaken in this thesis. Chapter 1 begins by recounting how deoxyribonucleic acid (DNA) evidence made a dramatic contribution to the resolution of two celebrated legal cases. It then draws attention to a number of social issues that have arisen with the advent of forensic DNA, such as possible threats to privacy and civil liberties through the storage of DNA profiles in databases. The discussion then covers how this thesis may assist in resolving these issues by making proposals in relation to the concerns raised. The rationale for the thesis is then presented, along with the research design and methods used. Lastly, the structure of the thesis is outlined.

Chapter 2 provides an historical background to the advent of current DNA profiling technology. The first scientific method used for identification in the criminal justice context was anthropometry, the measurement of parts of the human body. Fingerprint Science soon superseded anthropometry, and the use of fingerprints has been retained. Forensic serology – the analysis and comparison of blood types – was employed for over eighty years in the justice process before being replaced by DNA profiling. The chapter then recounts some discoveries leading to the development of forensic DNA, followed by its success in the Narborough Village murders. Organisational developments, DNA database operations, post-2000 issues and predictions for forensic DNA are also outlined.

Chapter 3 reviews previous studies on the effects of forensic evidence in the justice process. The chapter commences with an overview of pre-DNA studies conducted in the US and in the UK during the 1980s. Reviews of a US study on the post-conviction use of DNA to prove innocence, and two specialised academic studies on DNA evidence in Australia follow. The next section examines studies on the performance of the world’s first national criminal DNA database in the UK, along with a critical American study on DNA databases in the justice system. The Chapter then reviews a number of official publications in Australia followed by a section about “Forensic intelligence”. The Chapter concludes by listing hypotheses to be tested in the course of the thesis through the analysis of primary and secondary data.
CHAPTER 1: INTRODUCTION AND PROJECT DESCRIPTION

This chapter introduces the dissertation and provides an orientation to the research project. It opens by narrating two celebrated cases where DNA evidence made crucial differences to outcomes. The discussion then moves to larger issues surrounding the uses of forensic DNA, and the need for an examination, from a criminological perspective, of the roles of DNA in the justice process: specifically, its effectiveness when used during police investigations and in the courts. Some of the more controversial issues surrounding the use of forensic DNA are then identified, along with how this dissertation will aim to address them. These issues primarily relate to balancing the privacy and civil liberties of individuals with the maintenance of a safe society through crime control. Major concerns related to achieving this balance include the collection of DNA samples covertly, the possibility of DNA being “planted”, wrongly convicting the innocent through faulty DNA evidence, a disregard for the presumption of innocence during “mass” testings, an absence of government sponsored innocence panels, and storing DNA samples rather than retaining only the profiles. The background to this project and its rationale are then described, along with the project’s objectives.

DNA evidence making a difference

The spectacular impact that the science of DNA profiling has made on the justice process internationally and in Australia in less than two decades is well illustrated by considering two case histories described below. The first case was a murder that occurred in Queensland in 1983, where advances in DNA technology eventually, in 2001, led to a guilty verdict. The second case, involving two death row inmates, was championed by the Innocence Project at Cardozo Law School in New York. By March 2004, various Innocence Projects had successfully freed more than 140 innocent persons in the US by using DNA to assist in proving innocence after conviction.
Queensland’s 1983 Brampton Island murder

At Brampton Island on the Great Barrier Reef on 2 September 1983, the body of resort worker Celia Douty, aged 41, was found bludgeoned to death and her head covered with a towel. Police interviewed more than 300 guests and visitors on the island. There were no witnesses to the crime and no confession, but for eighteen years police suspected Sydney motor industry finance manager, Wayne Butler, of the crime after a family member contacted them and nominated him. The techniques for the DNA profiling were not sufficiently advanced to provide proof until more recently, when on the strength of DNA evidence, Butler was committed to be tried in 2001. The court heard that Douty, a waitress, had gone sunbaking at idyllic Dinghy Bay as she often did on her day off. Butler, who was holidaying in north Queensland at the time, made a day-trip to the island, where he went walking and exploring alone for four hours on the day Douty died.

DNA evidence confirmed semen stains on the towel covering Douty’s body as coming from Butler. The samples had been collected at the time of the investigation, but this was before DNA profiling had been developed. The chances of another member of the community having the same profile were given in court as one in \(23 \times 10^{15}\). Dr Kary Mullis, who won a Nobel Prize in Chemistry for devising methods for DNA replication, advised the defence throughout the trial, although he was not called to testify. Associate Professor Leo Freney, supervisor of Queensland Health’s Forensic Laboratory, provided testimony on DNA matches for the Crown and was supported by Dr Bruce Budowle, Senior Scientist at the FBI Laboratory.

The defence suggested that the DNA evidence had been contaminated in the laboratory, but the prosecution successfully rebutted this allegation by demonstrating that this was not possible, as the laboratory is compartmentalised by varying air pressures. The jury found Butler guilty, after which Supreme Court judge Justice John Helman admonished, “Butler, this is a savage crime for which the penalty is mandatory. You will go to prison for life.” (quoted in Thomas, 2002: 28). (See also Hansen, 2001: 15; Nolan, 2001: 12; Oberhardt, 2001: 3; R v Wayne Edward Butler [2001] QCA 385). In 2004, solicitors from Legal Aid were considering an appeal to
the State governor based on allegations of a labelling error in the case (Moore, 2004a: 11; 2004b: 38).

**Freeing the innocent from death row**

In the United States, DNA has achieved resounding success in assisting free wrongly convicted innocent persons from prison, some after having spent years on death row. This vignette illustrates such an instance:

In late February 1983, ten-year-old Jeanine Nicarico was taken from her home in Illinois. Her elder sister arrived at the house to find the front door ripped off its hinges. There were numerous footprints outside a rear window, which would later be used to support the theory that more than one person had been involved in the crime. Several days after her disappearance, Nicarico’s body was located in a forest. A post-mortem showed that she died from multiple blows to the head, while there was also evidence of a broken nose and sexual assault.

Several months after the offence, under pressure from the community and during a year when local elections were scheduled, the police picked up Alejandro Hernandez. For a small reward, he pointed them to Rolando Cruz with whom he was acquainted. Cruz, then a teenager, was picked up, and allegedly reported “visions” to the police. The details of those visions matched some aspects of the crime. The two continued to incriminate each other for cash rewards and petty benefits from the police. Hernandez was given a $10,000 reward for making incriminating statements against Cruz and against a third defendant, Stephen Buckley, who was never convicted.

Prosecutors based their case against Cruz and Hernandez on alleged incriminating statements that they claimed the two had made. Several witnesses testified that Cruz and Hernandez had divulged to them supposedly intimate knowledge of the crime. Investigators in the case did not aggressively pursue the alibi defences of both men. Finally, the most unsubstantiated and damning evidence was the testimony of the sheriff’s detectives, who testified that Cruz had reported “visions” of the murder, and that these “visions” closely reflected the details associated with the crime. Their
testimony was admitted as evidence even though they had made no attempt to record the vision statement.

Cruz eventually endured three trials and three convictions. In September 1995, DNA tests showed that spermatozoa from the crime scene could not have come from Cruz or Hernandez. On the other hand, a man named Brian Dugan, a convicted rapist and murderer, claimed to have committed the crime alone, and although DNA tests were unable to be specific, they indicated that he could not be excluded as a contributor of the DNA found at the crime scene. Prosecutors agreed to a retrial for the pair, but still asserted that they could have been present during the crime. Before the judge gave his verdict in the Cruz case, a sheriff’s department lieutenant recanted testimony he had given in previous trials, admitting that he was in Florida on the day alleged conversations were supposed to have occurred.

In November 1995, after both men had served nearly twelve years on death row, their cases were dismissed and Cruz and Hernandez were set free. The court acquitted Cruz and dismissed Hernandez’s case on the basis of the recanted testimony, the DNA evidence, and the lack of any corroborated evidence against them. Brian Dugan was not charged with the murder because his confession, made through hypothetical statements during a plea bargain for other crimes, could not be used against him (Innocence Project, 2003; Connors, Lundregan, Miller and McEwan, 1996: 44-46).

Each of these cases, highly publicised at the time, are examples of how DNA evidence can assist in reconstructing crimes, of the probative value it has enjoyed in court, and its potential to influence both pre- and post-court outcomes. However, there is a noticeable absence of comparative Australian studies that have examined the effects of forensic DNA on court cases, so it is uncertain from anecdotal evidence alone whether the absence or presence of DNA has any bearing on case outcomes in the criminal justice process overall. One purpose of this research, therefore, is to examine the effects of DNA evidence on decisions at different stages in the adjudicative process.
Social issues of privacy and civil liberties

An extreme fictional version of the unfettered use of DNA profiling for purposes of social and crime control was popularised in the film *GATTACA* (1997), from which concerns about its use appeared to climax. (The film’s title is a cryptogram composed of the abbreviations of the four amino acid base pairs that constitute DNA: Guanine (G), Adenine (A), Thymine (T) and Cytosine (C)). In a future society, humans are categorised at birth by a reading of their potential for achievement and for developing health problems from their DNA. A person’s place in the social hierarchy of “Valids” and “In-Valids” is therefore determined from birth. Social order is maintained through the collection and almost instantaneous analysis of forensic DNA from scenes where any deviations from social norms are suspected. The film’s setting is a modern reworking of Aldous Huxley’s classic novel *Brave New World* (1932), provoking parallel anxieties about genetic manipulation, biological enslavement and the loss of individual choice and freedom.

A number of contemporary controversies about DNA usage are reminiscent of issues raised in the film. Proponents of privacy and civil liberties have raised the following concerns in relation to forensic DNA and database records:

- Is our freedom to perform everyday acts such as throwing out rubbish like tissues, leaving around empty drink glasses or cigarette butts or spitting, being curtailed by the possibility that, in the absence of prohibiting legislation, police may gather such items and analyse them for our DNA?

- Could criminals or corrupt police plant, or use technology to “forge” or fabricate, DNA evidence and succeed in incriminating others?

- Could innocent persons be convicted and imprisoned through faulty DNA evidence that might result from inferior laboratory, police or prosecution practices? These might result from samples being incorrectly labelled, mixed up, or contaminated in the laboratory or elsewhere.
• Is the presumption of innocence being disregarded in the occasional situations where mass DNA testings are conducted, with persons being expected to “prove” their innocence by volunteering a DNA sample? Or does providing a DNA sample to police, under any circumstances, constitute a form of self-incrimination?

• Governments, including that of Queensland, have used the reputation of DNA with its ability to help prove innocence as a “selling point” for the introduction of DNA sampling and databases (Green, 2000: 9). Yet why have so few governments established innocence panels, and even fewer provided adequate funding to review deserving cases?

• Since the early 1970s, children in Australia have had a blood sample taken at birth and stored on “Guthrie cards”. Should these samples be available to police for forensic testing purposes, as has already occurred?

• Is there any sinister motive behind the retention of DNA samples by governments in Australia after forensic profiles have been extracted and recorded? For example, could these samples in future be appropriated and analysed to search for a genetic relationship to criminality or to determine individuals’ susceptibility to heredity diseases?

• Related to the above, why does Australian legislation not prohibit non-forensic analyses of criminal DNA samples, the results of which would be of great interest and value to insurance, biotechnology and pharmaceutical companies? Insurance companies in Australia presently can discriminate on the basis of genetic susceptibility to diseases (Barlow-Stewart and Keays, 2001), and the Commonwealth Parliament has rejected preventive legislation (Mould, 2003: 470).
Because of a lack of legislation or procedures to protect individuals’ privacy and civil liberties in the types of situations listed above, governments may be leaving open the path for a progression towards a GATTACA-like society. Chapters 10 and 11 discuss arguments related to the issues raised above and provide recommendations that may assist in dealing with them. This is achieved through aiming to balance the crime prevention and justice imperatives that DNA offers with the concerns about threats it may pose to civil liberties.

Forensic DNA and crime control

Politicians and senior police who advocate “tough on crime” policies justify DNA sampling for a wide variety of offences on the basis of the projected crime control benefits that they claim it offers. Further, academics in the US have seriously proposed universal DNA databases for crime control purposes (Cronan, 2000: 119-156; Kaye and Smith, 2003). This thesis aims to examine the veracity of such claims, and the extent to which they are feasible and realistic. Queensland’s Premier, Peter Beattie, for example, has stated:

The success rate in finding the criminals responsible for property crimes in the UK increased from 12 to 40 per cent virtually overnight when a DNA sampling and national database was established.

Our system will mean that if just one hair or speck of dandruff is left at the scene of a crime, the DNA pattern it contains is damning evidence when matched against the suspect’s DNA (Beattie, 2000: 1, quoted in Green, 2000: 65).

A number of questions can arise if this statement is applied to a fairly common offence like an assault in a hotel car park. Will police and forensic laboratories be supplied sufficient resources to collect, and analyse for their DNA pattern, all the hairs and specks that might be at the scene? Is it technically possible to obtain a DNA profile from shed hair or dandruff? If so, are the resources available to investigate all the leads that might be generated? How realistic has the Premier’s claim proved after
four years? Has the apprehension rate for property crimes more than tripled in Queensland in that time, as he implied it would? Or is his claim merely another example of the noticeable discrepancy Tracy and Morgan have described as, “the supposed benefits which many law enforcement and other elected officials are quick to claim but slow to demonstrate” (2000: 690).

In addition to statements by politicians, some senior police have also extravagantly lauded the potential for forensic DNA. The following appeared in the *Northern Territory News* in 2002 under the headline “Top cop’s DNA warning: crooks have nowhere to hide”:

Northern Territory police believe DNA profiling will bring most criminals to public account within the near future. Police Commissioner Paul White warned criminals yesterday that improved DNA technology meant they had nowhere to hide. “My message to the criminals is ‘no matter how hard you try our technology is becoming so advanced that soon you won’t be able to commit a crime without leaving a DNA profile to find’,,” he said (Bevan, 2002: 1,2).

Despite such optimism, it is difficult to conjecture how police could use DNA to combat many kinds of offences. White-collar crimes, like fraud, money laundering and tax evasion, credit card and identity theft, and cyber crime, such as releasing internet viruses, or participation in internet paedophile rings, drug trafficking and organised crime may largely be immune to DNA-based investigations. Even in cases like domestic homicides where DNA may be readily available, suspects residing there may have left it during legitimate access.

Sexual offences too, may be contested on the issue of consent, with defendants agreeing that intercourse occurred, but complainants alleging that it was without their consent. It is arguable that even the most frequently reported sexual offence, indecent assault, and common property crimes like theft of mobile telephones, would not result in sufficient residual DNA evidence being available for analysis using current laboratory procedures. Further, not all scientists will agree on the probative value of the DNA evidence in cases where it is available, and not all juries will understand it
or trust it, particularly if defence counsel question error rates (see Selinger’s comments on p. 35 and the discussion on laboratory errors on pp. 293-294).

While Commissioner White’s reported comment relies on DNA being found at every crime scene, a complementary proposal for crime control in the United States by John Cronan is the setting up of universal DNA databanks. These would contain the DNA profiles of a country’s entire population. Cronan explains:

If implemented, complete DNA databanks would spur unprecedented law enforcement benefits. Rates of convictions for violent and sex-related crimes would explode, while erroneous detentions and convictions for crimes with DNA evidence would plummet. At the same time, investigations would proceed expeditiously, thereby slashing many law enforcement expenses. Moreover, the mere existence of such databanks likely would trigger enormous deterrence that would lower the crime rate (Cronan, 2000: 122).

In Australia, the CrimTrac organization believes that more accused persons may enter pleas of guilty when confronted with incriminating DNA evidence, thereby saving considerable court costs. However, it cites no studies to support this opinion (CrimTrac, 2002). The research in this thesis aims to test, through quantitative analysis, such claims that are made on behalf of DNA. In Part B, this thesis aims through case study analysis to examine and to answer questions about the effectiveness of DNA evidence. For example, does the availability of incriminating DNA result in more cases being prosecuted? Do more defendants plead guilty when confronted with DNA evidence against them? What effect, if any, does DNA have on decisions by juries? Does it have any impact on sentencing decisions? Can DNA databases be used to reduce property offences like burglaries and car thefts? In Part C, Chapter 9 provides a summary and evaluation of the conclusions reached, while Chapter 11 lists recommendations aimed at achieving a balance between crime control and civil liberties.
Historical background to forensic DNA use

In dealing with crime in the last two decades, police and the courts have been able to incorporate into their arsenal of techniques “the secret of life”, a phrase coined by James Watson and Francis Crick, who in 1953 deciphered the structure of deoxyribonucleic acid, more commonly known by its acronym, DNA (Watson and Crick, 1953: 737-8). DNA is the genetic material that encodes the entire hereditary information about each individual in almost every cell of the body. It is found in all cells with a nucleus and is the same throughout the body. The DNA molecule has a spiral or double helix structure, and virtually every human fluid or tissue contains some DNA that can be analysed through DNA profiling.

Over time, DNA is relatively stable, so that even samples collected from crimes perpetrated many years ago can be compared to more recent samples. DNA is also resistant to many conditions that destroy most other biological materials, like proteins. The combinations of the four bases that constitute DNA are unique to each person with the exception of monozygotic (identical) twins. Although all humans share a significant majority of DNA, the remaining regions of the molecule are highly variable between individuals. These regions are exploited for forensic purposes by comparing the DNA profile from an unknown evidence sample to the DNA profile of a known individual or to other evidence samples. The regions compared are the “mini-satellite regions”, portions of the DNA structure that are unique to individuals and, except for cases of identical twins, provide a highly reliable method for human identification (Inman and Rudin, 1997: 29-35).

Figure 1.1 below illustrates in the “bar code” style a one locus DNA profile from a sexual offence. This was typed using the restriction fragment length polymorphism (RFLP) method of analysis. The analysis shown is of only one variable number tandem repeat (VNTR) locus. A more complete DNA profile would be compiled from the results of several such tests applied sequentially. Each VNTR locus has around 30 different length variants, or alleles, which occur at a certain frequency in the population. When four loci are tested, the probability that a given allele combination would occur in the general population is somewhere around one in five.
Australian forensic laboratories use an agreed polymerase chain reaction (PCR) standard that examines nine short tandem repeat (STR) locations, along with the sex gene. According to the Crim Trac organisation, this means that, except for identical twins, “the DNA profile of a person will have only one chance in many millions or billions of matching that of another person” (CrimTrac, 2002).

Human DNA can be found in the nucleated cells in tissue, blood or skin, or in spermatozoa. It may be obtained from white blood cells or from epithelial cells that have sloughed off the skin, or from semen. For forensic purposes, residual material retrieved from crime scenes, from victims or suspects, or from objects, may be analysed for DNA, and in many cases profiled for identification purposes. In addition to cells from blood, tissue, bone and hair roots, cells from saliva may be found on items like cigarette butts, drinking vessels, balaclavas and toothbrushes, while hats, weapons, clothing and car steering wheels may yield skin cells. Locard’s “Law of Contact” (1934) explains how any contact between two surfaces can result in an exchange of material, including DNA. Only small amounts of DNA are required, particularly where polymerase chain reaction (PCR) technology is used to amplify biological residue. Contaminants or degradation, however, can act to prevent a DNA profile being obtained (Speakman, 1999: 23; Wilson-Wilde, 2001: 4).
The results of RFLP analysis of one VNTR locus in a sexual assault case

In the illustration above, DNA profiles from Suspect 1 and Suspect 2 have been compared to the DNA profile extracted from semen evidence. It can be noticed in the example that the “bar code” profile from Suspect 1 matches the profile from spermatozoa found at the scene in the one locus analysed. DNA from Suspect 2 produces a profile totally different from the semen sample profile. DNA fragments from Suspect 2 have run much farther down the gel, meaning that they are shorter. DNA isolated from the victim, as well as a human DNA (K562) that serves as a standard size reference, are included as controls.
DNA profiling was first used for forensic purposes in the UK in the mid-1980s. Since then, it has evidently linked suspects to crime scenes by matching a range of biological samples. Until recently, DNA evidence has been utilised in major crimes such as homicides and sexual offences where body fluid traces like blood or semen could be sampled. Progressive advances in the sensitivity of DNA testing may allow traces as small as a single cell to be profiled (Findlay, 1997: 555-556) – although such tests have yet to achieve recognition for court purposes by quality assurance guidelines in laboratories. Melbourne researchers Roland van Oorschot and Maxwell Jones have claimed that swabbing the steering wheel of a stolen vehicle for epithelial cells might assist in the identification of motor vehicle thieves (1997:767).

In the last two decades, the use of DNA profiling has been increasingly recognised internationally as a standard tool in criminal investigations where trace DNA is available. It has gained worldwide acceptance through both case precedents and the interpretation of statute law. The first use of DNA profiling in the criminal justice context was for two rape-murders in Narborough Village in the UK in the mid-1980s. Those cases demonstrated the vastly improved discriminatory power of DNA over the previous serological methods of blood type analysis. DNA testing excluded one suspect, Rodney Buckland, who had falsely confessed to one of the murders, and it eventually confirmed the identity of the offender, Colin Pitchfork (Wambaugh, 1989).

The first completed case in Australia involving DNA evidence occurred in 1989 in a sexual offence case in the Australian Capital Territory (Coelli, 1989: 22-26). Legislation in different countries and throughout the Australian States and Territories has provided for the establishment of criminal reference DNA databases (Mobbs, 2001). Numerous instances can be cited worldwide where DNA evidence has been crucial to the solving and prosecution of cases (Inman & Rudin, 1997: Speakman, 1999). Chapter 2 provides a more detailed history of the incorporation of DNA into the justice process.
**Rationale, methods and research design**

DNA evidence has been hailed widely as the most significant technical advance in the justice area during the twentieth century. In the United States, the Bush administration has committed to funding DNA technology with $US1 billion over five years from 2003 (US Department of Justice, 2003: 1). Across the Atlantic, the Blair UK government has committed £208 million over the period 2000-04 to expanding the DNA program, one objective being to record the profiles of the entire criminal population, estimated at around 3.5 million (Gunn, 2002: 9). Despite the confidence in DNA displayed by these investments, there remains a noticeable lack of research from a criminological perspective about its overall effects in the justice process, a situation that the present research aims to address. By contrast, a wealth of literature does exist on the science of forensic DNA and on the application of relevant statute and case law, while anecdotal accounts of its efficacy in specific cases abound (see Inman and Rudin, 1997).

In selecting a research method, it was held that the value of DNA evidence could not be measured by theoretical speculation, by optimistic projections, or by anecdotal accounts, but by the collection and analysis of quantitative data. Methods used in this thesis to assess the effectiveness of forensic DNA in the justice process have been validated by Peter Grabosky (2003), one of Australia’s foremost criminologists. Grabosky has pointed out that Australian governments spend billions of taxpayer dollars each year on criminal justice and crime prevention. By 1999 Queensland alone was spending $1.3 billion on police, courts and prisons (Department of the Premier, 1999: 3). Grabosky has queried the effectiveness of this spending, and the degree of return that the public are receiving on this investment. He advocates a more rational and scientific approach to crime than presently used, observing, “solutions to crime are more often grounded in ideology than in science, and much debate on crime can better be described as a dialogue of the deaf, or a religious debate, than as rational discourse” (Grabosky, 2003: 1).
Grabosky has discerned a recent trend towards the more rational, scientific, approach. He has noted how criminologists in Australia and overseas have begun to formulate policies utilising evidence-based crime control; that is, policies that utilise rigorous quantitative research in order to determine which strategies are effective. Grabosky has outlined the elements of such an approach:

The randomised controlled trial is often referred to as the ‘gold standard’ of evaluation. It involves assigning subjects randomly to treatment and control groups, and comparing the outcomes recorded for each group. Because participants are randomly assigned, significant differences in outcome are attributable to the treatment as opposed to any other factor (2003: 1)

Such scientific rationalism has been criticised on the grounds that it is too demanding, too expensive and hence too restrictive, and that it can be capable of providing more information than may be required in some circumstances (Pawson and Tilley, 1998: 55-82). Nevertheless, similar control-comparison methods to those suggested by Grabosky were used in this thesis to assess the influence of DNA evidence at the various stages during the court process and in police investigations. For evaluating the effects in the courts, an archival study of case records was conducted where the characteristics of criminal case records from two different categories were compared. In the former were those referred to the DNA laboratory for the analysis of evidence, which resulted in a court statement associating the defendant with the crime, crime scene or victim. The latter category comprised similar cases for which no DNA evidence was provided. The differences that DNA evidence made, if any, could be assessed by comparing the characteristics of the DNA group to the control group at the various decision-making stages and allowing for the other evidentiary and extra-legal factors that influenced case outcomes.

A sample of 750 cases was selected for study, half involving court testimony of a DNA match and the remainder constituting the control group. The DNA cases were chosen from files held by the Forensic Biology Section of the Scientific Services Division of the Queensland Health Department. DNA evidence has been used in Queensland courts since 1991, and cases were selected from that jurisdiction for
convenience of access, as the research was based in Brisbane. The sample consisted of 200 sex offences, 200 serious assaults, 150 homicides and 200 property offences. The results of the analysis are presented in Chapters 4, 5, 6 and 7 respectively of this thesis.

All cases selected were referred by investigators for prosecution, either to the Office of the Department of Public Prosecutions (DPP) if tried in the superior courts, or to police prosecutors for the lesser offences that were adjudicated in the Magistrates Courts. The division of cases in this thesis followed the four major offence categories listed in the *Annual Reports* of the State’s forensic biology laboratory. Queensland Health’s Forensic Biology Section conducts almost all forensic DNA testing in the State at its premises in the John Tonge Centre – the rare exception being exhibits tested overseas using mitochondrial technology not yet available in Brisbane (Doneman, 2001: 1).

The non-DNA control group was selected from records of the Queensland Police Service and matched as closely as possible to the DNA group on the basis of time frame of occurrence, seriousness of offence, crime type and in many cases, police district. (The geopolitical area of Queensland is one jurisdiction serviced by one forensic laboratory and one police organization). Only cases regarded by police as solved and referred for prosecution were selected for both the DNA and the non-DNA groups. This was done so that cases could be tracked from the time they were referred for prosecution in the courts, through the different stages of the justice process to completion. The time frame selected for sampling the 750 cases ranged between the years 1994 and 2001. This range of years was necessary to ensure an adequate number of cases, and so that the cases would have finished progressing through the courts and where appeals were made, be finalised in the appeal court, by the time of data collection.

Both evidentiary and extra-legal factors are known to influence court outcomes. Therefore defendant statements, witness statements, prior victim-defendant relationships, fingerprint and photographic evidence and defendant demographics like race, age, sex and employment status were accounted for in the analyses. This approach allowed differences in outcomes between the DNA group and the control
group at various stages to be measured, and hence how DNA evidence affected decisions at those points was assessed. These decisions included those by the DPP on whether to prosecute cases, decisions by defendants on whether or not to plead guilty, decisions by juries on guilt or innocence and decisions by courts on sentencing. Advanced techniques of logistic and multiple regression were used to assess the strength of DNA in relation to other forms of evidence.

In order to evaluate the effects that DNA evidence and DNA databases could have on police investigations, studies were sought that relied on control-comparison methods. For police and policy makers to achieve evidence-based good practice in policing, control-comparison methods can differentiate what works in attaining police goals from what does not work. In the absence of any such structured studies in Queensland, a New South Wales police operation directed at volume crime reduction in three Local Area Commands (LACs) was assessed. In the operation, DNA and fingerprint evidence, along with other systemic improvements, were used to target recidivist offenders who were believed to have committed a large proportion of such crime. The assessment of the operation was made by comparing volume crime levels in the three LACs to crime levels in the same LACs for the previous year. Changes in background levels for volume crimes in the remainder of the State over the period were also taken into account. A report on the operation is reviewed in Chapter 3, and the operation is further examined in Chapter 8.

**Structure of the thesis**

The intention of this thesis is to investigate the overall effects of forensic DNA profiling on the justice process relying on control-comparison methods where feasible. The two main relevant components of the justice process, police investigations and court decisions, are examined. The thesis is presented in three parts, A, B and C, which further divide into eleven chapters.

As noted, Part A is made up of three chapters that provide introductory and background material. In Chapter 2, the historical background to identification in the justice process is recounted, and the application of such techniques as anthropometry, fingerprinting and forensic serology, as well as DNA profiling, is reviewed. Chapter
3 provides a literature review of previous studies and journal articles that relate to the questions examined in the thesis, and it develops hypotheses to be tested.

Part B follows the introductory chapters, and presents case studies and data analyses on the use of DNA evidence. Data were collected in Queensland, where DNA has been used as court evidence since 1991. Chapters 4 through to 7 use quantitative analyses to measure the effects of DNA on the adjudicative process. These chapters examine the four types of crime where DNA evidence was most commonly available to prosecutors: sexual offences, serious assaults, homicides and property offences respectively. Data from several hundred cases that used DNA, along with data from a control group of similar cases without DNA evidence, 750 cases in total, were analysed statistically. From these analyses, the effects of DNA on decisions about whether cases reached court, on guilty plea decisions by defendants, on jury decisions and on sentencing were assessed.

Chapter 8 deals with the investigative and intelligence uses of DNA by police through the application of DNA databases, where trace samples from crime scenes are matched to stored profiles. The CrimTrac national Australian DNA database did not become fully operational until March 2003, and was still well short of achieving its potential at the conclusion of this research. However, the fact that databases had been established in the individual States for some years allowed an evaluation of a police operation in New South Wales that used forensic DNA. An assessment of potential for burglary investigations was also made by examining the ratio of convictions achieved through DNA to reported crime for the UK national criminal DNA database, which has been operating since 1995.

The final section, Part C, provides an assessment and recommendations. Chapter 9 evaluates the findings from the data analyses in Part B about the effectiveness and limitations of DNA in assisting to achieve the goals of criminal justice. Chapter 10 relates the use of DNA profiling and DNA databases in criminal investigations and prosecutions to issues of individual privacy and civil liberties. Chapter 11 concludes the thesis by proposing a model system of law, procedures and infrastructure that aims to balance the goals of criminal justice while preserving civil liberties in the application of DNA profiling. It includes a series of recommendations and some
suggested directions for future research, along with a recapitulation of the main points.

CONCLUSION

This chapter commenced by illustrating the spectacular effects that forensic DNA can have in the justice process by recounting two cases where it altered outcomes: one in which a murderer was convicted 18 years after the crime, while in the other, two innocent men were released from death row. Questions were then raised about potential infringements of privacy and civil liberties that may accompany the use of forensic DNA in the absence of legislation intended to safeguard these community values. Claims made by politicians and senior police about the efficacy of DNA as a means for crime control were also quoted, along with the goal of this thesis to examine the authenticity of these claims. The chapter briefly outlined the historical background to the use of DNA in the justice process. It then justified the theoretical basis for using control-comparison methods in the quantitative chapters of the thesis as opposed to anecdotal accounts or theoretical speculation. Lastly, the chapter described the structure of the dissertation, consisting of three parts further divided into eleven chapters.
CHAPTER 2: HISTORY OF FORENSIC IDENTIFICATION AND DNA PROFILING

INTRODUCTION

The development of the technique of DNA profiling in 1984 by Alec Jeffreys was a watershed in forensic science progress. This chapter examines, in two sections, scientific developments in criminal identification before and after Jeffreys’ discovery. In the justice system, identification has three primary facets: one being the confirmation of identity of persons previously arrested, the second being the linking of individuals evidentially to crime scenes, and lastly, the identification of unknown deceased persons. DNA profiling has the potential to perform all three functions, as well as the capability of linking crime scenes to each other. Forensic science generally, and techniques used for human identification, have no comprehensive overarching theoretical structure, but have been derived from pragmatic and eclectic adaptations from other branches of science (Inman and Rudin, 2000). The history of criminal identification has drawn from the disciplines of anthropometry (the systematic recording of body measurements to identify criminals), fingerprint science, serology (the analysis of blood for evidentiary purposes) and, most recently, molecular biology.

The first section of this chapter begins by briefly recounting Alfonse Bertillon’s introduction, from 1883, of anthropometry. This is followed by a section on fingerprint science, which, from the fin de siecle years, brought absolute certainty to this endeavour of criminal identification. Fingerprint science added the advantage of allowing the identification of criminals where appropriate trace evidence was found at crime scenes. The first section concludes with the history of biological testing aimed at identifying trace evidence, such as bloodstains from crime scenes, and developments in molecular biology to 1986, and how these tests became increasingly discriminating over time. In the second section, the chapter provides a brief history of the evolution and development of forensic DNA profiling methods from 1986 to the
time of writing. Forensic science has a tripartite structure, being concerned with crime scene examinations, laboratory analyses and court presentations. Throughout this chapter, the emphasis is on how laboratory scientific analysis has been applied to the criminal justice process. The social and legislative implications of these developments are analysed in greater depth in relation to the findings of this thesis in Chapters 10 and 11.

SECTION 1: IDENTIFICATION SCIENCE PRE-DNA PROFILING

A number of factors prompted the development of biometric identification technologies in the late nineteenth century. The primary impetus came from a change in the philosophy of punishment that has been described by the French thinker, Michel Foucault (1979), while changes wrought by the industrial revolution and colonisation provided a source of motivation. Under classical reasoning, punishment was related solely to the seriousness of the crime for which an offender had been convicted, and any criminal history was largely irrelevant.

With reforms to theories of punishment, the character of the offender was considered in determining the sentence: first-time offenders were treated comparatively mildly, while habitual offenders were sentenced with increasing severity in relation to the extent of their criminal histories. For proportionate sentencing, some reliable form of personal identification was required, because if criminal histories were filed under a person’s name, offenders could circumvent them simply by adopting one or more aliases. Changes that also impacted on personal identification during the nineteenth century were rapid urbanization accompanied by increasing anonymity; the breakdown of rural and village life where individuals had been thoroughly familiar with their neighbours; migration between cities, between countries and between continents; and the necessity for the orderly governing of populations, such as those imperial Britain possessed in India (Cole, 2003: 2).
Anthropometry

Alfonse Bertillon, an assistant in the First Section of the Paris Prefecture of Police, introduced the first scientific method recognised as being used successfully for criminal identification in 1883. The need arose to systematise the criminal records of the Sûreté (“Security” or criminal police), whose archives had by 1879 accumulated over 5 million items, including criminal files based on 80,000 photographs. The records had grown too clumsy to be useful, so Bertillon proposed, and eventually implemented, an elaborate system of eleven measurements of nine parts of the body to provide a supposedly unique profile for an individual. Offenders’ measurements were taken and recorded on index cards. The classification by names was proving of little use, as murderers, thieves, burglars and counterfeiters often changed their names. Bertillon’s system was soon proven in practical application (Thorwald, 1965: 14, 39).

The scientific foundation for Bertillon’s system of anthropometry was based in the works of the Belgian astronomer and criminal statistician Adolphe Quetelet (Thorwald, 1965: 19, 22). Bertillon worked on the principle that the measurements of a person’s bones remained the same in all adults throughout life. He then took Quetelet’s “law”, that the chances of any two persons being exactly the same height was one in four, and that if one more measurement were added – for example, the length of the trunk – the chance of finding the same measurements in any two persons decreased to one in sixteen. By extending the number of measurements to eleven, the cumulative probability of two criminals having exactly the same measurements would be four to the power of eleven ($4^{11}$) or over four million to one (Bertillon, 1881).

The system proved superior to the previous methods of reliance on the memory of detectives and on an overburdened, unreliable, filing system. After a trial period in France, anthropometry was accepted and spread internationally, to be used as a method of identifying arrested persons and prisoners. Unknown deceased persons were also measured and searched against the index cards on file in an effort to identify them. Bertillon had been subject to the influence of science in his formative years. His father was a distinguished physician and anthropologist, and his grandfather a well-known naturalist and mathematician. He had observed them
measuring innumerable skulls of people from all races, seeking support for the theories of Charles Darwin (1936)[1859] by trying to relate the shape of the head to the intellectual evolution of humans. Anthropometry, or “Bertillonage,” was widely used for criminal identification until the early years of the twentieth century. In 1903, according to many accounts, it was largely discredited by the Will West case. At Fort Leavenworth Penitentiary in the United States, two prisoners, Will West and William West, supposedly were found to have identical anthropometric records. The fingerprint impressions of the Wests, though, were distinctly different (Moennsens, 1971: 19-20). Cole, however, debunks the West story as largely mythical and describes the transition to fingerprint science as occurring more gradually (2001: 140-167).

**Fingerprint Science**

Although the development of fingerprinting was less positivistic in its derivation from scientific reasoning than was anthropometry, it has been proven in use for over a century, and the fingerprint is still central to modern criminal identification. Fingerprint science is based on the classification of the friction ridge skin patterns on the inner surfaces of the fingers and palms. Friction ridge skin patterns develop on the human foetus in the first three to four months of gestation and are subject to random non-genetic events during embryological development. Hence, even identical twins and clones will have different fingerprints, and fingerprints are still regarded as an infallible means of personal identification (Saferstein, 1998: 437-439; Ashbaugh, 1999: 184).

The earliest recorded practical use of inked palm and later thumb impressions was by Sir William Herschell, a British administrator in India in 1858. JCA Mayer of Germany had first theorised in 1788 that the arrangements of friction skin ridges were unique; while in 1823, Johannes Purkinje, a Professor of Anatomy at the University of Breslau in Prussia, distinguished nine different fingerprint pattern types and formulated rules for their classification (Moennsens, 1971: 6, 7, 10). Foundations for modern fingerprint science were made in the last two decades of the nineteenth century by Dr Henry Faulds and Sir Francis Galton. As a Scottish medical missionary in Japan, Faulds experimented with, and proved the persistence of, fingerprints by
having his students shave the ridged skin off their fingertips. He then confirmed that the regrowth followed exactly the same patterns. Faulds advocated the use of fingerprints to establish or confirm the identification of unknown deceased persons, and for the detection of criminals from impressions found at crime scenes (Faulds, 1880: 605; 1894: 548). These uses have long since become well established (Cole, 2001).

Galton was the founder of modern eugenics – the concept of improving the human race by selective breeding (see also Chapter 10 under “Use and misuse of genetic data”). Galton was a first cousin to Charles Darwin and studied fingerprints from numerous racial groups and across the social strata. He applied lengthy personal investigation to the task, while carefully examining the discoveries of his predecessors and contemporaries. Galton published the first textbook on fingerprinting, and formulated its three fundamental principles, which are:

1. A fingerprint is an individual characteristic; no two fingerprints have yet been found to possess identical ridge characteristics.
2. Apart from growth and injury, a fingerprint will remain unchanged throughout an individual’s lifetime, and until decomposition after death.
3. Fingerprints have general ridge patterns that allow them to be systematically classified (Saferstein, 1998: 440-444).

Galton also suggested a method of classification (Galton, 1892). However, he was reluctantly forced to conclude that, while fingerprints were individual, they bore no trace of character, racial affiliation, social or occupational status, evolution or temperament (Rabinow 1992: 5).

The first practical fingerprint system to be used was created by Dr Juan Vucetich of the La Plata Police Department in Argentina in 1891 (Vucetich, 1904). Vucetich developed a system of classification, which, with modifications, is still used in South American and Spanish-speaking countries, and in numerous other jurisdictions (Ashbaugh, 1999: 31). The system allows for the filing, retrieval and comparison of fingerprints based solely on the pattern types and ridge counts. Sir Edward Henry, an Englishman acquainted with Herschell and Galton, devised an alternate system that
came to be used throughout the English-speaking world. Henry’s system was officially accepted in India in 1897 and endorsed by the British government’s Belper committee for criminal identification in the UK in 1900 (Lambourne, 1984: 64).

The first recorded major crime solved through fingerprints was the Rojas case in Argentina in 1892. Bloody fingerprints were found at a crime scene where two children had been murdered. Fingerprint evidence was used to exonerate an accused suspect and Vucetich matched a print in blood to the victims’ mother, who then confessed to the crime (Ashbaugh, 1999: 30-32). Credit for first solving a crime through fingerprints where there were no apparent suspects (or in modern forensics terminology a “cold hit” or match) goes to Alphonse Bertillon, who had added fingerprints to his anthropometric index cards. By searching through the fingerprint impressions on his anthropometric cards, Bertillon found a match for the fingerprints found on the glass door of a cabinet at a murder scene in Paris in 1902. The offender recorded on the card was subsequently convicted and executed (Moennens, 1971: 18-19).

Dr Edmund Locard, a pioneering forensic scientist with degrees in both law and medicine, formulated the “Law of Contact” at his Lyons laboratory in the 1920s that explained the existence of trace evidence such as fingerprints (and later DNA):

> When two objects come into contact there is always a transfer of material from one object to the other. Often this transfer is obvious, at least in one direction, but even when the amount of material transferred, or its nature is such that nothing is visible, there is always some transfer (Locard, 1934: 27).

Locard’s law explains the presence of fingerprints, DNA and other trace evidence at crime scenes. Because of their cost-effectiveness, fingerprints are currently used to confirm the identity of arrested persons, while the concept and use of fingerprint computer databases since the 1980s to generate “cold hits”, and legislation covering powers to fingerprint, have provided models for the establishment of criminal DNA databases and related legislation (Cole, 2003).
Serology

Forensic serology refers to the analysis of blood for evidentiary purposes. Blood is the most common type of biological evidence found at crimes of violence (Fisher, Svensson and Wendel, 1987: 188). Progress in forensic serology was judged as related to advances in the specificity of such tests. It aimed to answer such questions as, “Is this substance blood, that was found on the suspect’s clothes?”, then, “If so, is it human blood?”, and further, “Whose blood is it?”.

The “ABO” blood typing groups were the first genetic markers used for human identification and were discovered in 1900, the same year that fingerprints were selected in the UK as a means of personal identification. There are four major phenotypes in this system, designated the A, B, AB and O types by Karl Landsteiner (1900). Scientists investigating the cause of blood transfusion reactions had found that when they mixed blood that was incompatible, the red blood cells precipitated and the cell surface elements responsible for this reaction could be identified and divided into the four antigen groups.

By 1902 Landsteiner, along with Max Richter, suggested that ABO typing of forensic bloodstains could be used to help identify associations between blood at the scene of a crime and a suspect (Landsteiner and Richter, 1902). While it was realised that blood groups were inherited, the genetic basis for the mode of inheritance was not established until 1925, through inference from the population frequencies of the four groups (National Institute of Justice, 2000: 13). These blood groups were the first polymorphisms documented in humans; that is, “genetically determined alternative forms of a marker in a population with frequencies too great to be maintained by mutation alone” (Shaler, 1997: 21).

It was found that the differences among ABO blood group types between people could be exploited to determine who might be the donor of evidentiary stains. Both wet and dry stains could be tested using this system and blood types were constant, because an individual will always have the same blood type. Body fluids other than blood could be typed but to a lesser extent. About 78% of the population are “secretors”, or individuals who have ABO blood grouping substances present in other
bodily fluids. If a person was a secretor, it was sometimes possible to ascertain the ABO blood group from saliva on a cigarette butt, semen in sexual assault cases, or perspiration. These were important considerations for forensic purposes (Fisher et al., 1987: 201, 205).

The ABO groups occur with a particular frequency in a given population. In Australian Caucasians it was found that around 38% are in group A, 13% belong to group B, 3% are of the AB type and the remaining 46% are in the O group category (Phillips, 1988: 550). This means that if two bloodstains found at a crime scene were typed, and one was group A and the other group B, they must have come from different persons. If, as a second example, both stains were group B, they could have come from the same person, but they may also have come from different persons, both of whom happened to be group B. It can also be stated about the second example that individuals who are not type B – about 87% of the population – could not be a source for the bloodstains. Individuals who may be suspects might be tested to determine if they have the same genetic blood type as the evidence, thereby establishing if they are possible donors (Inman and Rudin, 1997: 6-8).

In cases where the blood types were the same, such as in the second example above, there was little of a probative nature that a serologist could testify to, except to say that a subject with type B was not excluded as a source of the blood. Because types A and O constitute approximately 38% and 46% respectively of the Australian Caucasian population, it is probable that a significant number of people will have the same ABO type (Inman and Rudin, 1997: 6-8). The goal of genetic typing became to reduce the frequency of occurrence of the blood type to the smallest number possible. By 1980, further blood grouping systems using protein and enzyme markers had been developed. By routinely testing in a dozen such systems, it was not unusual for scientists to determine that a particular bloodstain could have come from one person in a thousand or fewer (Fisher et al. 1981: 200).
One such genetic marker introduced in the early 1970s by the Scotland Yard laboratory was Phosphoglucomutase (PGM). The PGM type 1+ occurs with a frequency of 19% in the population. If a bloodstain were examined and found to be type A in the ABO classification, and also typed in the PGM system and found to be type 1+, the overall significance of the findings are calculated by multiplying the frequency of the ABO type A (38%) by the frequency of the PGM type 1+ (19%), or 7% (as 0.38 x 0.19 ≈ 0.07). That is, only 7% of the Caucasian population are both ABO type A and PGM type 1+. As more markers are added and the probabilities multiplied, the proportion of the population who might be donors continues to decrease. The ultimate ambition of forensic scientists became to link with certainty the origin of biological evidence such as blood, semen, hair or tissue to a single individual. The goal of forensic DNA typing has been the same – to decrease the number of possible donors to a minimum until individualization is effectively achieved (Inman and Rudin, 1997: 8).

**Molecular biology to 1986**

The English naturalist Charles Darwin laid the foundations for scientific genetics in the nineteenth century with his theory of natural selection, which attempted to account for the evolution of new forms of life and in which he recognized the principles of mutation and selection for speciation and evolution. In 1866 Gregor Mendel, an Austrian monk, discovered that hereditable traits split up and recombine in an orderly manner when transmitted to offspring, although his work went unnoticed until 1900. Further milestones were the extraction and chemical analysis of nucleic acids by Johann Miescher, and Wilhelm Roux postulating that chromosomes are the carrier structures of inheritance (Mange and Mange, 1999: 1-7).

Although DNA was first discovered in 1868, modern molecular genetics began only in 1944, when Oswald Avery and co-workers demonstrated that DNA was the substance by which genetic traits are transferred from one generation to the next. This came as a major surprise to most researchers, including Avery, who believed that DNA did not have the necessary phenotypic diversity required by the complexity of living organisms, as it consisted of only four organic bases: adenine (A), cytosine (C), guanine (G) and thymine (T) (Saferstein, 1998: 403; Krawczak and Schmidke, 1994: 1-7).
In 1953 James Watson and Francis Crick’s seminal work at Cambridge University elucidated the double helix model for DNA, which combined known physical and chemical data on its structure with the requirements necessary for its replicative and coding functions (Watson and Crick, 1953: 737-38). This structure of DNA was then ultimately able to provide, through chemistry, an explanation for Mendel’s studies on heredity and for Darwin’s theory of evolution.

In 1980, in order to produce a human gene map, David Botstein and co-workers exploited the small variations found between people at the genetic level. The type of variation used by Botstein’s team was Restriction Fragment Length Polymorphism (RFLP), a technique later used among forensic DNA workers (Inman and Rudin, 1997: 19, 37-40). Until 1985, however, these developments in molecular genetics had only been of peripheral interest to forensic scientists. In 1984, while using RFLP technology to search for disease markers in DNA, Alec Jeffreys and his colleagues at Leicester University, England, made a discovery with far reaching implications for forensic identification. They found that portions of the DNA structure – “minisatellite regions” – were unique to individuals except for cases of identical twins.

The result Jeffreys produced was a multi-banded pattern that somewhat resembles a supermarket price-tag barcode. Figures 1, 2.1 and 2.2 illustrate the technique at a layperson’s level. Jeffreys dubbed the discovery “DNA fingerprinting”, although the terms “DNA profiling” or “DNA typing” are now preferred to avoid confusion with dermal fingerprints (Jeffreys, Wilson and Thein, 1985: 67-73 and 76-79; National Institute of Justice, 2000: 15). The first forensic use of DNA was in the following year in the UK in an immigration paternity case (Jeffreys, Brookfield and Semeonoff, 1986: 818-819)
The results from just one VNTR locus alone do not pinpoint a suspect any more than one digit of someone’s telephone number would indicate their identity. For example, a certain percentage of people are likely to have the number 2 as the third digit in their telephone number. Similarly, for any given VNTR locus, a fragment length corresponding to a certain number of sequence repeats occurs in a certain number of individuals. What gives DNA profiling its power is the combined analysis of a number of VNTR loci located on different chromosomes.

The final DNA profile is compiled from the results of four or five probes that are applied to a membrane sequentially. Each probe targets a different VNTR locus. Using four probes (as in the figure below) provides eight pieces of information about an individual, since every person has two separate copies of each VNTR region. To add to the complexity, it turns out that each VNTR locus usually has approximately 30 different length variants (alleles). Each of these alleles occurs at a certain frequency in a population. To get the probability that a given 8 band profile will occur, the eight different allele frequencies are multiplied together.
While the number of repeats at a single VNTR locus cannot distinguish an individual from the remainder of the population, the combined results from a number of loci produce a pattern unique to that person.

Using four loci, the probability that a given allele combination would occur in the general population is somewhere around 1 in 5,000,000. In the United States, the FBI incorporates 13 sites on average into its profiles. With 26 different bands studied, the odds of finding two unrelated individuals with the same DNA profile are astronomical; the odds of a match in this case are well over one in a hundred billion. Ultimately, unless a person has an identical twin, they are statistically two thousand times more likely to win a lottery with odds of 1 in 50,000,000 than to have a DNA profile that matches that of someone else (Genelex, 2001; How Stuff Works, 2001. Reproduced with permissions; see also Brenner, 2004).
SECTION 2: FORENSIC DNA PROFILING

1985 to 1990

The Narborough village murders

It was the use of DNA profiling in the Narborough Village murders in England that caught the public imagination and ensured the eventual adoption of the technique worldwide. A 17-year-old kitchen hand, Rodney Buckland, for reasons unknown, had confessed in a recorded interview to the second of two rape-murders of teenage girls in 1983 and 1986, but denied being involved in the first. The investigating officer, David Baker, had read of the work of local Leicester scientist, Alec Jeffreys, who agreed to analyse body fluids from both victims and from Buckland. Jeffreys linked the semen on the victims to the same source using his recently discovered technique of DNA profiling. However, he found that the DNA profile from the recovered spermatozoa did not match that of Buckland’s blood. After being held in custody for several months, Buckland then became the first prime suspect to be released as a result of DNA analysis (Gill and Werrett, 1987: 145-148).

A mass screening of around 5,000 men from three villages in Leicestershire was conducted but did not result in a match. The perpetrator, Colin Pitchfork, finally confessed after his co-worker, Ian Kelly, while drinking in a hotel, told patrons that he had been coerced by Pitchfork into taking the test on Pitchfork’s behalf. The pair had substituted Kelly’s photograph onto Pitchfork’s passport. The DNA profile of Pitchfork’s blood was found to match those from the evidence on the deceased, and in January 1988 Pitchfork was sentenced to two life terms in prison [R v. Pitchfork and Kelly (Eng. 1987)]. A fact-based novel, The Blooding, widely publicised these events (Wambaugh, 1989). This first use of DNA profiling in a serious crime exemplified its power to exculpate the innocent and the importance of security procedures in mass screenings. Civil rights proponents have pointed out, as will be seen in Chapter 10, that it was not the DNA testing itself that inculpated Pitchfork, but the request that he be tested (Gans, 2001a: 37).
Early convictions using DNA

From 1985 to 1987, the Forensic Science Central Research Establishment at Aldermaston in the UK undertook studies on forensic DNA in order to optimise use of the technique by crime investigation departments. In October 1987, prior to the completion of the Narborough Village cases, the first conviction using DNA profiling had been achieved in Britain. A disabled woman had been raped in her home near Bristol, but was unable to identify her attacker. Crime scene samples were later matched to blood samples taken from a suspect. Two days before he was due to stand trial, Robert Melias, changed his plea to one of “guilty” when confronted with the DNA evidence. The Crown Prosecutor advised the court that there was only one chance in four million among the male population of an incorrect identification. The offender was sentenced to eight years imprisonment (Phillips, 1988: 551).

The first completed case in Australia involving DNA evidence occurred in the Australian Capital Territory in 1989. The offender, Desmond Applebee, was found guilty of three sexual assault charges after the DNA pattern from his blood matched that of a blood-and-semen-stained pair of briefs from the victim. The odds of a chance match were cited as being one in 165 million. During the course of the trial, Applebee changed his defence from “I wasn’t there” to “police are not credible” and later to a claim that the woman had “consented”. This prompted Dr Ben Selinger, Head of the Department of Chemistry at the Australian National University, to predict that given the strength of DNA evidence, future rape trials would doubtlessly hinge on the issue of consent, rather than on identity or denial. He also stressed the importance of security and accuracy in the collection of samples and in the preservation of the chain of evidence (Coelli, 1989: 22-26).

Forensic DNA in the United States

In 1986, Kary Mullis in the United States of America developed the Polymerase Chain Reaction (PCR) technique and received a portion of the Nobel Prize in Chemistry in 1993 (Mullis, Faloona, Scharf, Saiki, Horn and Erlich, 1986: 263-273). PCR is an enzymatic process for increasing the amount of DNA in a sample through amplification in vitro. An analogous term would be “molecular photocopying”. Only
a small section of the DNA of interest is copied, but this is done with very high fidelity to the original. The DNA strands replicate themselves in consecutive steps over a number of cycles so that the amount available increases dramatically. Each new strand synthesised acts as a template for a further amplification cycle, so that the target region of interest increases logarithmically after each cycle. After 25 cycles, there will potentially be $2^{25}$-fold amplification (assuming 100% efficiency). Technical explanations of the process are readily available in appropriate texts (for example Bing, 1997: 41-44; Inman and Rudin, 1997: 41-50; Easteal, McLeod and Reed. 1991: 129-140).

The advantage of PCR over RFLP is in the sensitivity of the process, as PCR can utilise much smaller stretches of non-degraded intact DNA. Samples as small as 0.2 to 0.5 nanograms (ng), or $10^{-9}$ of a gram, can be tested. This is around 100 times less material than needed for RFLP analysis, and is the equivalent of a drop of blood the size of a large pinhead, or around a thousand sperm (compared to hundreds of millions in the average ejaculate). Analysts using PCR, however, need to consider the possible presence of contaminants when evaluating evidence. The material on which a stain is deposited – clothing, soil, leaves, or chemicals present like soap, bleaches or oils – may affect the quality of the sample (Inman and Rudin, 1997: 15, 41).

DNA profiling was first introduced into the United States commercially by Lifecodes Corporation and Forensic Science Associates. The earliest conviction in the US primarily based on DNA evidence was a rape case in the State of Florida in 1988 \cite{Andrews v. State, 533 So. 2d 841 (Fla. Dist. Ct. App. 1988)}. The defendant, Tommy Lee Andrews, a former pharmaceutical clerk, was convicted at the end of a second trial, of attacking a woman in her home in Orlando. The woman was unable to identify Andrews, but he was later arrested following a car chase, and his fingerprints were matched to those developed on a window screen at the rape scene. DNA in semen from a vaginal swab was then matched to his DNA (Shaler, 1997: 27). In the first trial, the jury had been allowed to hear evidence of the DNA test results, but not the related statistical data, and had been unable to reach a verdict. A later appeal against the eventual verdict was dismissed, resulting in the first ruling by an appellate court in the US in favour of admitting DNA evidence (Easteal et al. 1991: 113; Saferstein, 1998: 433-34).
A case that saw DNA evidence strenuously challenged both on legal and scientific grounds was *People v. Castro* in New York [545 N.Y. S.2d 985 (Sup. Ct. 1989)]. A mother and her two-year-old daughter had been stabbed to death in their Bronx apartment. Detectives questioned a neighbourhood handyman, Jose Castro, and in doing so, noticed a small bloodstain on his watch. Scientists extracted about 0.5mg of DNA from the stain and issued a statement to the District Attorney indicating that the profile on the watch matched that of the mother. The report, based on the RFLP technique, claimed that the chances of a random match were about one in one hundred million in the Hispanic population and it indicated no ambiguities or difficulties (Freckelton, 1992: 11).

On legal grounds, DNA evidence in *Castro* had its admissibility questioned under the decision enunciated in *Frye v. United States* [293 F.2d 1013, at 104 (D.C. Cir. 1923)]. The *Frye* test predicates the admissibility of novel scientific evidence on its general acceptance in a scientific field. In the *Castro* case, Justice Sheindlin of the New York Supreme Court held that scientists in genetics and related fields generally accepted the theory underlying DNA profiling, and that forensic DNA had been accepted and was reliable. However, the judge ruled that the laboratory did not perform the test using the necessary quality controls to ensure reliability. This decision established the notion that quality assurance would become an important factor in deciding the admissibility of DNA evidence. A decision by the Supreme Court of Minnesota confirmed this in November 1989, when it became the first appellate court to reject DNA evidence. In *State v. Schwartz* [447 N.W. 2d 422 (Minn. 1989)] it was held that the forensic laboratory had not complied with appropriate standards and controls, and had not made available its testing data and results (Lander, 1989: 501; National Research Council, 1992: 135; Shapiro and Reifler, 1996: 43).

In 1989, Gary Dotson became the first person to have a conviction overturned on the basis of DNA analysis in Chicago. Dotson had been convicted of aggravated kidnapping and rape. The complainant had stated that in July 1977 she was walking home from work when two men forced her into the back seat of a car and raped her. In March 1985, the complainant recanted her former testimony, but both the judge at a retrial motion and the governor rejected the victim’s recantation, and the Appellate Court of Illinois affirmed Dotson’s conviction in 1987 (*Dotson v. State of Illinois*, 516
In 1988, Dotson’s new attorney ordered tests not available at the time of the alleged rape. These showed that semen on the victim’s underwear had not come from Dotson but could have come from the victim’s boyfriend. A new trial was ordered, but the State attorney’s office decided not to prosecute based on the DNA test results and on the victim’s lack of credibility. Dotson had served eight years of a 25 to 50 year sentence (Connors et al. 1996: 51-51). Such post-conviction exonerations have provided an opportunity to reassess the effectiveness and accuracy of the justice system in relation to factual innocence and have acted as a stimulus for research on that topic (see for example, Freedman, Leahy and Neufeld, 2001; and Westervelt and Humphrey, 2001). Chapter 10 revisits this topic under the heading “Exonerating the innocent through DNA profiling”.

The late-1980s

In the same year as the Castro case, 1989, a number of other significant events occurred. Police in Victoria used DNA profiling to obtain a conviction against George Kaufman, who had raped sixteen women over a four-year period in Melbourne’s southeastern suburbs. Faced with DNA evidence, Kaufman confessed in recorded interviews lasting eight hours. He was sentenced to 21 years imprisonment (Police Life, 1996: 14-17). A week after Kaufman’s conviction, on 11 October 1989, a former New South Wales police officer, Harold James Blackburn, had no evidence presented against him in the Magistrates Court after being arrested in a blaze of publicity on serial rape and assault charges. The case was one of the first in Australia to attempt to utilise DNA technology. Evidence was sent to England for DNA testing, even though Blackburn’s blood type was O-positive and the offender was known to have A-group blood and to be a secretor (Brown and Wilson, 1992: 196-215).

DNA technology had begun, by 1989, to move from the research laboratory into the realm of practical application, and advisory committees were set up for the legal community, the prosecution, the defence and the judiciary, while different jurisdictions implemented legislative panels to review its implications. The Australian Institute of Criminology (AIC) convened a conference at which a number of issues raised by the novel technology were discussed. Scientists, lawyers and police addressed issues of quality control and how expert testimony would affect their
areas of work (Vernon and Selinger, 1990). International input was provided by Kenneth Nimmich, head of the Scientific Analysis Section of the FBI Laboratory in Washington. His paper included an outline of the proposal by the FBI to create a computer-based national database for DNA profiles (Nimmich, 1989). Australia had already demonstrated leadership in a forensic science field by its establishment of the world’s first national fingerprint database in 1987. This AIC conference was a precursor to the federal government and governments of several States beginning to develop standards and procedures for DNA collection and handling.

Questions of policy in the U.S. regarding DNA profiling were addressed at a 1989 conference in New York State. This considered the forensic use of genetic information from broad social and legal perspectives, as well as the specific legal issues of admissibility and interpretation in court. It further examined the issues of regulation and accreditation of laboratories to assure performance, and of DNA databank development (Ballantyne, Sensabaugh and Witkowski, 1989). Meanwhile, serious objections to forensic laboratory testing methods and procedures were being raised in courts worldwide, both on the grounds of quality assurance and on the statistical interpretation of the test results. In most cases these objections were surmounted. But arguments about statistical interpretation of results were founded on the premise that forensic scientists’ reporting of results produced a weightier probability factor than objectively existed, because their calculations were based on limited population databases (Shapiro and Reifler, 1996: 44).

The 1990s

Technological advances

Advances in the technology of DNA profiling continued during the 1990s. By 1991, PCR methods were used to isolate DNA from trace biological samples and were refined to allow epithelial cells – those from the outer layer of the epidermis – found on cigarette butts, postage stamps or envelopes, to be profiled (Bing, 1997: 46). Two Melbourne researchers in 1997 announced successful profiling of swabs taken from objects merely handled by individuals, such as leather briefcase handles, pens, car keys and telephone handsets. They pointed out that “there are many cases in which the genetic profile of individuals who have handled or touched particular objects
associated with a crime could be extremely important to an investigation” (van Oorschot and Jones, 1997:767).

Criticisms of these claims included a failure by other laboratories to duplicate the experiments successfully. It was pointed out that the amounts of DNA tested might not satisfy current laboratory accreditation standards which require strict validation studies and minimum peak heights for the reporting of results (Freney, 2003). But by 2000, researchers at the University of Queensland were able to profile traces as small as a single cell (University of Queensland, 2000:23) while the Australian Genome Research Facility estimated that such a “single cell” technique produced reliable results in 84% of cases (Findlay quoted in Smith, 2000). The early-1990s also saw a number of textbooks on scientific methods and forensic DNA profiling become available (for example, Kirby, 1990; Robertson, Ross and Burgoyne, 1990; Easteal, McLeod and Reed, 1991).

The tests used in forensic laboratories became more refined during the 1990s. The years 1985 to 1995 were dominated by the use of the RFLP analysis, and a variation of this called VNTR (variable number of tandem repeats). These methods were replaced around 1997 by the AMPF/STR Profiler Plus, a system that was expected to remain in use for at least ten years. All Australian jurisdictions agreed in 1998 to adopt the ProfilerPlus system in order to create a common standard, and in _R v. Karger_ [2001] SASC 64 (29 March 2001) Mullighan J. held that the system was reliable and accepted by the relevant scientific community.

PCR analysis rapidly superseded RFLP as it overcame many of the limitations of other systems. The Perkin-Elmer Corporation made the first commercially available DNA testing kit. This was the AmpliType HLA DQA-1 PCR DNA amplification and typing kit. The same company subsequently marketed other kits including the Amplitype PM PCR DNA, commonly known as the “Polymarker”, which distinguished the alleles of five genetic loci, and the Amplitype PM+DQA1 PCR DNA, which enabled simultaneous amplification and typing of all six loci from the same PCR reaction. Other profiling methods employed in the 1990s included the D1S80, a PCR system and STR (short tandem repeat) analysis, the ABI Prism 377 DNA sequencer, the British Quadruplex, and Genescan and Genotyper software.
In 1996, mitochondrial DNA (mtDNA) evidence was used in court for the first time to assist in achieving a conviction. Distinct from the nuclear DNA used for other typing methods, the mitochondrion is one of the small subcellular compartments, or cell organelles, where additional genetic material resides. This genetic material is transmitted overwhelmingly through the mother, so that the inheritance pattern of mtDNA is maternal. It is often the last typable DNA present in minute, degraded or old samples and has been found in vestiges of cells in hair shafts, bones and teeth. It is unable to confer identity, however, but places individuals into a general class. The FBI in 1996 opened its DNA Analysis Unit II, which uses mitochondrial DNA testing on evidence samples when the sample is degraded or contains an insufficient amount of DNA for either RFLP and/or PCR testing (FBI, 2001). Using this technique in the United States, hair found on the body of a four-year-old girl who had been raped and murdered was associated with one Paul Ware through mitochondrial DNA and he was convicted of the offence in 1996 by a jury in Chattanooga, Tennessee (State v. Ware, 1999 WL 233592 (Tenn Crim. App., Apr 20, 1999, No. 03C019705CR00164); Inman and Rudin, 1997: 50-52, 153).

The potential for mtDNA to assist in the investigation of antiquated crimes was demonstrated with the identification of the remains of the Czar Nicholas Romanov and members of his family, executed in 1918 by the Bolsheviks, and whose bones were exhumed from a multiple grave in Yekaterinburg, formerly Sverdlovsk, Russia, in 1991. The British FSS had confirmed the relationship among five family members and had determined the sex of each in 1992 using STR techniques. Mitochondrial DNA from Britain’s Prince Philip, whose maternal grandmother was the Czarina’s sister, was matched to the Czarina Alexandria and her three daughters, as all had inherited the same mtDNA from the mother of both Alexandra and her sister (Gill, Ivanov, Kimpton, et al., 1994). Subsequently, the remains of Czar Nicholas II were authenticated (Ivanov, Wadhams, Roby, et al., 1996). Although such research findings generated justifiable euphoria about DNA typing, the media portrayal of forensic DNA as a panacea to high levels of reported crime was not realistic. For
example, Professor Sir Alec Jeffreys, who originated DNA profiling, cautioned with reference to RFLP typing, that DNA had “proved to be far less useful in routine forensic analysis of samples where DNA is often partially degraded or is recovered in amounts too small for DNA fingerprinting” (1993: 206).

**Organizational developments**

By the 1990s, following recommendations by forensic scientists and justice administrators who saw the potential for the technology, governments in Australia, the US and the UK had developed official policies favouring the greater usage of DNA profiling. Evidence was welcomed that, when properly used, DNA could eliminate suspects early in investigations, improve the accuracy of court findings and exonerate the innocent. One obstacle to the increased usage of forensic DNA was legislation that lagged behind the developments in technology, a situation not uncommon in other areas of genetic research. Problems encountered by policymakers included balancing the legalities of retrieval and storage of samples from suspects and the establishment of DNA databases with privacy and civil liberty considerations. Legislation was also seen as desirable where it would clarify the admissibility of DNA evidence and by law enforcement agencies to facilitate the taking of reference samples.

In 1990, a criminologist, Dr. Patricia Easteal, submitted a report to the then Australian Police Ministers’ Council entitled *The Forensic Use of DNA Profiling in Australia: Need for a National Database* (1991). The same Council in 1993 received a report from Alastair Ross, then head of the newly founded National Institute of Forensic Science. This review, *Considerations of the Easteal Report* (1993), endorsed the recommendations of the former. It subsequently commissioned a working party of police, lawyers and scientists to make recommendations on the feasibility of uniform legislation relating to privacy issues and database security (QPS, 1996: 1). In 1995, the Standing Committees of Attorneys-General (SCAG) proposed a legislative scheme for a national DNA database and arranged for a Model Forensic Procedures Bill as a legislative framework (Green, 2000: 7).
By 1998, Australian forensic laboratories had agreed to a common national standard for DNA profiles. Financial difficulties in the implementation of the database project were largely resolved when, in September 1998, the Australian government announced the establishment of the CrimTrac project as a means of “fighting and preventing crime” through a national information system and by the use of technology (Department of the Prime Minister, 1998: 1). Part of the $A50 million provided to CrimTrac was to be available for a National Criminal Investigation DNA Database (NCIDD), thereby resolving any possible impasse in the area of finance for that project (Vanstone, 1998; Department of Attorney-General and Justice, 1998). In 2000, Australian jurisdictions passed legislation to extend DNA sampling and to facilitate a national criminal DNA database. However, it took a further three years, and a decade after the Ross report, before an Australian national DNA database became operational on 3 March 2003.

The popular press attributed the lengthy delay in implementation to inter-State legislative differences (Gregory and Watt, 2002: 10). Official sources tended to confirm this:

The [national criminal DNA] database, which will be part of a Nationwide investigative aid for Police (called CrimTrac), is still not online. The problems being experienced are primarily legal, not scientific” (Queensland Health Forensic Biology Section, Annual Report 2001-02: 2)

The legal problems alluded to were that laws applicable to the sampling of suspects varied from State to State, so that in some circumstances, a profile taken from a suspect in one State might not be allowed to be compared with a crime scene profile recovered in another (Mobbs, 2001: 11-19).

While the concept of a national DNA database was in its formative stages in Australia, the National Institute of Forensic Sciences (NIFS) was founded in 1992. Its charter included the development of standards of quality control and accreditation of forensic science laboratories throughout Australia. This was partly in response to the severe criticisms of forensic scientists for poor quality work and unacceptable
attitudes made by two Royal Commissions, which had examined the cases of Edward Charles Splatt and Lindy Chamberlain (Royal Commission, *Shannon Report*, 1984; Royal Commission, *Morling Report*, 1987). These Royal Commissions resulted in the exonerations of both Splatt in 1984 and Chamberlain in 1987, the latter case receiving worldwide publicity. Forensic evidence and forensic expert testimony had been crucial in the convictions of both accused (Brown and Wilson, 1992: 1-19, 81-98; Freckelton, 1992, 10-11).

By 1990, in the United States, under sponsorship of the FBI, local crime laboratories, academics, the federal government and private parties formed the Technical Working Group for DNA Analysis Methods (TWGDAM), which formulated recommendations for quality guidelines for forensic DNA profiling laboratories (TWGDAM, 1991). The US federal government initiated three separate reports on DNA evidence, the first by Congress’s Office of Technology Assessment and the other two by the National Research Council under the auspices of the National Institute of Justice (Office of Technology Assessment, 1990; National Research Council, 1992, 1996). The US government overtly promoted the use of DNA technology through the *DNA Identification Act of 1994*. This legislation authorised funding for the individual states to develop forensic laboratories capable of conducting DNA analysis subject to quality controls and contingent on FBI supervision. This Act also provided finance for the FBI to develop a national DNA databank (Shapiro and Reifler, 1996: 43-51).

In 1993, the US Supreme Court indirectly overruled the 70-year-old *Frye* standard on the admissibility of scientific evidence, which, as was noted earlier in the *Castro* case, had been used to limit DNA evidence [*Frye v. United States*, 293 F. 1013 (D.C. Cir. 192)]. Instead, it was held that the Federal Rules of Evidence superseded the *Frye* test [*Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 113 S. Ct. 2786, (1993)]; (Shapiro and Reifler, 1996). The importance of impeccable handling of DNA evidence was demonstrated when the highly publicised murder case against American football legend, O.J. Simpson, collapsed, in part because his defence attorney, Barry Scheck, showed that police had mishandled crucial blood drops (Bugliosi, 1996 quoted in Saferstein, 1998: 423-429; Inman and Rudin, 1997: 117-120). In 1996, the US National Institute of Justice published a research report *Convicted by Juries, Exonerated by Science* (Connors et al., 1996). The report examined cases where
forensic DNA had assisted in proving innocence after conviction, and it will be reviewed in Chapter 3.

**DNA Databases in operation**

The world’s first DNA database on a national scale began operations on 10 April 1995 and was located in the United Kingdom. The UK Forensic Science Service (FSS) had developed a Single Locus Probe Database in 1990, but the Police and Criminal Evidence Act 1984 had restricted its use. The same Act also governed the taking of samples from individuals by police and it did not allow such samples to be obtained except to prove or disprove a person’s involvement in a serious crime. The UK police services and the Forensic Science Service then carried out a feasibility study into the establishment of a DNA database. It noted that the methods of the six forensic science laboratories in the UK would need to be standardised in order to achieve compatibility for comparison purposes.

The FSS then made a pilot study in the County of Derbyshire in 1992. The results of that study supported the setting up of a national DNA database using the Short Tandem Repeat (STR) method. STR profiles are produced by copying four different sections of DNA (the von Willebrand antigen, vWA; plus the THO1, the F13 and the FES). These sections are found only in humans and vary in size between people. It further recommended swabbing the inside of the cheeks, or buccal swabs, as a means of taking body samples for reference profiling. Such swabs would be considered non-invasive samples and could be taken without the consent of an arrested person. As a result of the pilot study, a case was presented to the Royal Commission on Criminal Justice, which endorsed recommendations for a national DNA database and buccal swabbing via *The Criminal Justice and Public Order Act, 1994* (Dovaston, 1996: 17-23).

A research study, *The Ability to Challenge DNA Evidence*, was also completed on behalf of the same Royal Commission, which was investigating the admissibility and reliability of forensic evidence shortly after the release of the wrongfully convicted “Birmingham Six”. The main conclusion of the research study was that prosecutors should give defence counsel adequate notice of their intention to present DNA
evidence, so that a defence expert could be engaged, preferably with Legal Aid support, to examine scientists’ findings (Steventon, 1993).

Within five years, the FSS database held over one million DNA profiles of suspects and of convicted criminals, and was claimed to have matched one hundred thousand crime scene samples to suspects. It was also reported to achieve over 600 matches per week between crime scenes and suspects (CrimTrac, 2003). According to another report, in the five years after its inception, the UK national DNA database had produced 10,000 matches between crime scenes and suspects and had “cleared up”, on average, 333 crimes per month. In one three-year period DNA testing had matched suspects to 212 murder and manslaughter cases and to 868 sexual assaults (Doherty, 2000). No figures were provided on how many convictions resulted from these matches.

In 2000, the Blair Labour government began to outlay £208 million ($A500m) for a four-year expansion program aimed at storing profiles of all recordable offenders – some three to three-and-a-half million – on the database (Gunn, 2002: 10). By July 2004 the database held over 2.5 million personal profiles, and claimed, on average, a 44% chance of an immediate match between an unsolved crime scene sample and a personal profile, although some regions reported higher match rates (FSS, 2004: 11, 15). The West Midlands Police by 2002 had claimed a match rate of 58% (Leary and Pease, 2002: 3), and by 2004, according to the FSS, “perhaps the most notable [outcomes] have been the extension of a burglary initiative in Leeds to other parts of West Yorkshire producing a 67% primary detection rate using DNA matches” (FSS, 2004: 11).

Criminal DNA databases were also instituted in other countries including New Zealand, Canada, Germany, Norway, Finland, Denmark and the United States with varying degrees of success (Schneider and Martin, 2001). The New Zealand database became operational in August 1996 and within five years held over 16,000 individual DNA profiles with around 400 more being added each month. Approximately 36% of all DNA samples collected from crime scenes have been matched to profiles on the database, about 78% of the matches being in relation to burglaries (CrimTrac, 2001; see also Walsh, Kleim, Moss and Vintiner, 2002). Canada’s national DNA databank
opened on 5 July 2000 at an initial cost of $C10.6 million with an annual cost of $C5 million, and uses the FBI initiated Combined DNA Index System (CODIS) to allow compatibility and cross-comparison of profiles in North America (Kerr, 2001: 24; Windover, 2001: 2).

The need for digitised comparisons of DNA profiles, especially across different databanks, invited some form of standardisation. In response, the FBI developed the Combined DNA Index System (CODIS) as a national database and searching mechanism, research for which had commenced in 1990 with a pilot. CODIS is a software-based system that uses two Indices to assist criminal investigations by comparing matches between the Convicted Offender Index, containing DNA profiles of felons, and the Forensic Index, containing DNA profiles from crime scenes (FBI, 1998). In order to encourage the use of CODIS, the FBI offered the software, along with installation, training and user support free of charge to all law enforcement agencies or their affiliated laboratories. By 2001, more than one hundred laboratories in over twenty-nine countries were using the system.

CODIS relies on 13 STR core loci, which provide a common standard to facilitate communication between laboratories and allow great discriminatory power. It is claimed that the probability of a random match of the profiles for two unrelated Caucasian Americans – assuming random mating – is $1.74 \times 10^{15}$ or 575 thousand billion. Eight of the CODIS loci are among the ten used by Britain, so international comparisons with the U.K. are feasible (National Institute of Justice, 2000: 2, 19). Australia, with its smaller population, requiring less astronomical odds for a random match, relies on nine loci produced by the AmpF/STR Profiler Plus PCR Amplification Kit. The international organization that facilitates exchange of police information, Interpol, has also assisted towards standardising DNA comparisons worldwide (Interpol, 2002). The CrimTrac agency in Australia, however, did not adopt the FBI’s CODIS system, as a policy decision was made to produce the software locally for the Australian national database.
Post 2000

After 2000, with scientific progress achieved, and legal precedents established, noticeable advances in research concentrated on developing systems to utilise the intelligence edge that DNA could provide to police. DNA databases, in particular that in the UK, had reached a point where they could steadily produce hundreds of matches or hits per week. Both in the UK and in New Zealand, where national DNA databases had been established in 1995 and 1996 respectively, there was a 40% chance or more that the source of a crime scene sample loaded into the database could be identified. To meet the challenge both of converting these matches into convictions, or using them to reduce crime levels, appropriate intelligence and other support systems needed to be implemented or improved.

From 1998, West Midlands Police in the UK commenced developing a Forensic Led Intelligence System, or FLINTS, which relied on matches from the DNA database and from fingerprints, combined with other intelligence sources (Leary and Bailey, 2003). By late 2003, Version 6 of FLINTS had been developed and integrated with the UK’s National Intelligence Model, and around half of police personnel in the West Midlands force had been trained in its use (Leary, 2002; Tofiluk, 2003b; see also Chapter 8 and Appendix B). In the UK, police inspection reports made recommendations directed at maximising the impact of DNA matches (Blakey, 2000a; 2002), while in 2003 an external evaluation was conducted in New South Wales of a police operation that aimed to reduce volume crime through forensic science usage (Jones and Weatherburn, 2004).

In the United States as at 2003, the outlook was not as optimistic. A study by the National Institute of Justice found crime scene samples and prisoner samples in the US to be suffering a significant backlog. For rape and homicide offences, around 350,000 cases were waiting to be tested, and the number of collected, untested convicted offender samples was between 200,000 and 300,000. Between 500,000 and 1,000,000 convicted offender samples had still to be collected (National Institute of Justice, 2003). In response to this study, the Bush federal government provided one
billion dollars to be used over five years to assist with clearing the backlog (United States Department of Justice, 2003: 3-4)

Most media attention associated with DNA in Australia, in 2000 and later, focussed on the legislation that would allow sampling for the national and various State databases and on related issues of privacy and civil liberties. Some academics also criticised the legislation (Saul, 2001; Gans, 2001b; 2003). Issues that were raised included why samples would not be destroyed, as was done in New Zealand, after profiles had been obtained (Keays, 2000: 11). Public discussion about DNA sampling was stimulated by the SBS television program Insight, which showed a video on 31 May 2001, of an inmate at Bendigo Prison in Victoria being held down by three officers in riot uniforms whilst a sample of blood was taken by force by another person in the presence of an additional five officers and a police dog. These and other issues stemming from the legislation are explored more fully in Chapters 10 and 11.

**Predictions for forensic DNA**

Predictions about DNA profiling and its uses through to the year 2010 were the subject of a National Institute of Justice study *The Future of Forensic DNA Testing* (2000). The study concluded *inter alia* that STR technology would predominate during the coming decade, and that:

- miniature chips will make possible analysis at crime scenes, with results being transmitted electronically to databases making immediate identification or elimination of suspects a possibility;
- techniques for handling degraded DNA will improve, with mitochondrial DNA playing an increasing role;
- criminal DNA databases will be extensive and coordinated and international comparisons common;
- an increasing number of suspects will be generated through database searches; and that suspect searches will be narrowed through the identification of physical traits of individuals who have contributed DNA at crime scenes (National Institute of Justice, 2000: 2-6).
A multidisciplinary team at the University of Michigan announced in October 1998 the development of a “lab on a chip” that automatically analyses DNA samples and reports the results electronically. As well as forensic uses, potential applications of the device, which provided additional incentive for its creation, included on-the-spot categorisation of endangered species in remote locations, and the diagnosis of infectious diseases in minutes rather than in days (Burns, Johnson, Brahmasandra et al., 1998: 484-487). In the UK in 2004, researchers were concentrating on Low Copy Number (LCN) techniques for extracting DNA profiles from very small numbers of cells, such as in the residue of a fingerprint (Findlay, 2004; Orr-Munro, 2001: 22-23, Werrett, 2000: 22-24). Australian researchers also have been in the forefront of DNA research. Dr. Angela van Daal at the Queensland University of Technology is working in an area relevant to police intelligence. Her research aims

…to identify which genes in humans produce specific characteristics like eye, hair and skin colour as well as height and build. Once we know which genes are responsible for which traits, we can test blood, saliva or semen to reveal what our suspect probably looks like (QUT, 2000: 1).

She predicted that in “two to five years’ time” this kind of genetic testing would revolutionise criminal investigations (QUT, 2000: 1). Such research has prompted newspaper claims that suspects may soon be identified from a speck of dandruff they leave at a crime scene (Sydney Morning Herald, 16 September 1999: 7).

CONCLUSION

Within a few years of its discovery in 1985, DNA technology had made a profoundly positive impact on the criminal justice process. Through its ability to solve “unsolvable” crimes, the scientific mystique associated with it, and forensic scientists’ use of arcane language and obscure acronyms, DNA caught the public imagination. The technique gained acceptance in courts of law in numerous countries by 1990, and in 1995 the first national criminal reference database for DNA samples became operational in the United Kingdom, with other countries establishing databases in the years that followed. As a forensic method, DNA profiling completely replaced, in
just a few years, the earlier techniques of serology and blood markers that had been
developed and used over the previous eighty years.

During the 1990s, techniques for analysis became more refined and uniform, allowing
information interchanges and comparisons between different laboratories and
countries. Researchers in the 1990s began work towards obtaining a physical picture
of a suspect from trace evidence found at crime scenes, while a hand-held DNA “lab
on a chip” was already a reality. DNA proved its value, firstly, in assisting with the
conviction of many guilty parties, thereby often providing some satisfaction to victims
of crime; secondly, it helped free more than one hundred wrongly convicted innocent
persons; and additionally, it helped eliminate persons as suspects early in
investigations. After 2000, matches provided by DNA databases began to be
integrated with other forms of police intelligence with the objective of maximising
their effectiveness. However, legislation in Australia to facilitate DNA sampling,
passed in 2000 in the States and Territories, continued to be subject to criticism by
advocates of privacy and civil liberties, and by some academics.
CHAPTER 3: LITERATURE REVIEW AND HYPOTHESES

INTRODUCTION

This literature review summarises previous studies that have assessed the effects of forensic evidence, of forensic DNA profiling and of DNA databases in the justice process. The chapter commences with two major overseas empirical studies on forensic evidence from the 1980s, along with a journal article from that era. Following this, a report on how DNA evidence has assisted in the post-conviction exoneration of innocent persons in the United States is examined. The findings of two Australian university postgraduate theses from the 1990s specifically concerned with DNA profiling are then summarised. A number of studies from the United Kingdom, where a national DNA database has been operating since April 1995, are then reviewed. A journal article from the United States about DNA databases is also included. Prior to legislation on DNA sampling in 2000, a number of State government publications, along with various Ombudsmen and Privacy Commissioners addressed this issue, and a review of one of these reports is included. The recent development of forensic-led intelligence software programs that integrate information from DNA databases with other forms of crime intelligence is examined along with their application in crime reduction and prevention operations. From this literature review, a number of hypotheses are listed for testing in later chapters.

Approach

Material for this review was collected from diverse hard copy, electronic and other sources. Initially, libraries in Brisbane associated with the universities, the Queensland Police Service and the Queensland Government Chemical Laboratory were searched. Databases of publications and journal articles in the areas of criminology and forensic science were then consulted, including Criminal Justice Abstracts, the Australian Criminology Database (CINCH), the Australian Federal Police Digest (AFPD), the Attorney-General’s Information Service (AGIS) and the
ForensicNetBase. Searches were made of the Internet websites such as those of the US Department of Justice’s National Institute of Justice, the FBI, the UK’s Forensic Science Service, the UK Home Office, and in Australia, CrimTrac, the National Institute of Forensic Science, and websites containing papers from Symposia of the ANZFSS and from other conferences. The website of the Victorian Parliament Law Reform Committee’s *Inquiry into Forensic Sampling and DNA Databases* provided submissions containing highly relevant information.

Interviews and personal contacts with the QPS DNA Unit, QHSS Forensic Laboratory staff, the ANZFSS (Qld. Branch) members and guest speakers, and staff and students at Griffith University and QUT resulted in referrals to additional sources. Correspondence with the Association of Chief Police Officers in the UK resulted in their providing material. Because research on forensic DNA in the justice process remains in a phase of rapid growth, much of the material cited was published during the course of this research. It will be clear from the References that the above listing of sources is by no means comprehensive.

**Pre-DNA research on forensic evidence**

In 1984, the US Department of Justice’s National Institute of Justice published a research report, *Forensic Evidence and the Police: The Effects of Scientific Evidence on Criminal Investigations*. The report was the product of a three-year study by Joseph Peterson, Steven Mihajlovic and Michael Gilliland at the Center for Research in Law and Justice at the University of Illinois, Chicago. Data for the study were gathered from police departments, crime laboratories and prosecutors’ offices at four geographically separated and demographically diverse sites: Peoria, Illinois; Chicago, Illinois; Kansas City, Missouri and Oakland, California. The project aimed to assess the effects of different types of forensic evidence on the apprehension, prosecution and conviction of offenders. The types of physical evidence the study covered were inclusive of any found at crime scenes: fingerprints, ballistics, tool marks, hair; fibre, glass and shoe print comparisons, serology – semen and bloodstain analysis, analysis of volatile fluids from arsons, handwriting comparisons and document examination.
The report also analysed additional case samples where only fingerprints were examined, and another where suspected drugs were the only evidence collected. As the DNA profiling technique was not available until after 1986, DNA evidence was not included in this study. Around 2,700 cases were retrieved for data analysis: 1,600 investigations where physical evidence was collected and 1,100 cases where it was not. Because these cases were segmented among four study sites to allow interjurisdictional comparisons, case numbers for each site numbered in the hundreds. Crime categories examined were homicide, rape, serious assault, robbery and burglary.

An excerpt from the report’s Abstract summarised its conclusions:

Among the findings of the study are that rates of clearance for robberies and burglaries are significantly higher in investigations where physical evidence is examined, than in cases where it is not. Forensic evidence has its greatest effect in cases which traditionally have the lowest solution rates – cases with suspects neither in custody nor identified at the outset of the investigation. Moreover, a significantly higher percentage of persons arrested for the crimes of burglary and robbery are convicted in cases with forensic evidence. The effects of scientific evidence on the clearance and prosecution of aggravated assault cases is less pronounced and, in many cases, not significantly different from cases where forensic evidence is not used (Peterson et al., 1984: iv).

At the court level, cases with forensic evidence were found to result in significantly higher rates of conviction than cases without this evidence. The cases with physical evidence were regarded as quite special if for no other reason than their success in surviving the numerous screening levels of the criminal justice process: that is, cases with physical evidence tended to go to trial a higher percentage of the time. In rape cases, Peterson’s research team found in all jurisdictions that the rates of conviction were higher when semen was analysed using the serological methods then available, or when other evidence linking the victim and suspect was found. In homicide cases,
it was found that, “conviction rates, in two [out of four] of the jurisdictions studied, are significantly higher...where physical evidence linking the offender with the crime is developed” (1984: xvii). The study tended confirm the arguments of other researchers around that time, such as Steer (1980) that forensic evidence did not usually solve cases by itself, but rather that it strengthened investigations and prosecutions where other evidence was available.

The report made policy recommendations for police agencies and crime laboratories. These included crime scene preservation responsibilities for patrol units, placing crime scene technicians in the same organisational unit as the crime laboratory and that investigators should give greater consideration to potential physical evidence and should recognise its value by making arrests that have a greater probability of resulting in convictions. Detectives should also work more closely with crime laboratories in assigning priorities to cases submitted for analysis. Police administration needed to support the conduct of research to assess the impact of physical evidence.

For crime laboratories, the report suggested that a more active role should be adopted in developing procedures for crime scene examination and for the setting of priorities in the examination of cases. Management reporting systems should be implemented to permit an ongoing assessment of the impact of physical evidence on case investigations and prosecutions. A suggestion for the prosecutor’s office was to enhance communication by designating a forensic science resource advisor who could provide feedback to laboratories on all cases involving physical evidence; and who would coordinate inquiries, investigations and overall liaison with the laboratory. Lastly, the report suggested directions for future research. Integral to this would be a laboratory based case management reporting system, which could cost-effectively collect the necessary data for defining the contribution of evidence categories to the investigation of different crime types.

In the United Kingdom, Malcolm Ramsay (1987) authored Home Office Research Study 92, The Effectiveness of the Forensic Science Service, which concentrated almost exclusively on the provision of forensic evidence to investigators. The Forensic Science Service (FSS) in England and Wales “exists to provide impartial
information about cases submitted to it involving physical evidence from scenes of crime, such as broken glass or blood-stained clothes” (Ramsay, 1987:1). The FSS did not analyse human remains, nor did it deal with fingerprint evidence. The work of the FSS was largely within the discipline known as criminalistics: grouping bloodstains or semen; examining fire scenes for evidence of arson; comparing shoe prints, hairs and fibres. The research design for the Home Office Study involved detailed examination of a sample of 600 cases where the police sought FSS assistance. The cases sampled were from 1984, prior to the use of forensic DNA. Attention was concentrated on homicides, wounding, sexual offences, burglaries, robberies, thefts, arson and damage. These types of cases preoccupied the FSS and the police Criminal Investigation Departments.

Scientists were asked to complete questionnaires about the cases, and 547 responses were received relating to 593 cases. A sub-sample of 395 cases was chosen for interviewing police investigators, and 330 such officers were interviewed. The questionnaires and interviews aimed to assess the nature of the police-scientist relationship and endeavoured to gain a comprehensive perspective of the outcomes of their joint efforts. The main findings of the Home Office Report, reproduced verbatim, were:

- The police refer only a small … proportion of cases for forensic analysis, which tends to be tried only when other avenues [of investigation] have been well explored.
- Cases where the FSS is approached tend to be of above-average seriousness, while different police forces vary quite considerably in the extent to which they make use of the FSS.
- The FSS provided useful assistance to the police in over two-thirds of cases studied.
- The FSS is generally used to confirm the case against suspects who have already been identified; they may well have been charged before the FSS is contacted by the police (Ramsay 1987: 39-40).
Also in 1987, Peterson and colleagues followed up the 1984 research with a sequel in the US *Journal of Forensic Sciences* entitled, “The Uses and Effects of Forensic Science in the Adjudication of Felony Cases” (Peterson, Ryan, Houlden and Mihajlovic, 1987: 1730-1753). The aim of the project was to address the effects of forensic science evidence on decisions to charge defendants, to determine their guilt or innocence and to decide the severity of their sentences. Six study sites were used, four being the same as in the 1984 study, while New Haven and Litchfield, Connecticut were added. A random sampling of felony cases files from three years (1975, 1978 and 1981) was tracked from the point of charging to final disposition. Other research methods included a mail survey of all crime laboratories in North America; interviews with prosecutors, defence attorneys and forensic science examiners in all six sites; distributing a set of hypothetical cases to trial attorneys to gauge the relative effects of scientific versus other types of evidence; and conducting exit surveys of several hundred jurors after major court trials to record their views of scientific evidence and surveys of expert witnesses.

In the statistical analysis of the cases in the study, eight significant variables were controlled for: tangible non-scientific evidence, seriousness of the incident, defendant statements, witnesses, arrest circumstances, victim-defendant relationship, prior record and defendant demographics. Three of these variables proved to be significant predictors of conviction: age, incriminating statements and tangible evidence. Conviction rates tended to be higher when the forensic evidence linked the defendant with the crime. After taking into account sociodemographic and evidentiary factors, the authors found that scientific evidence made little difference in prosecutors’ decisions to charge defendants, or even to the determination of the guilt or innocence of those charged. The principal form of evidence that influenced decisions to convict or acquit was confessions. Forensic science reports and testimony were found to have their greatest impact at the time of sentencing, when convicted defendants were more likely to go to prison and for longer periods of time where scientific evidence was presented. The thoroughness, extensive scale and advanced methods used in the Peterson studies have ensured their long shelf life and continued relevance twenty years on.
Post-conviction exonerations

Prior to any studies on the overall effects of DNA evidence in the justice process, its ability to assist in the accurate reconstruction of crimes was apparent. The United States National Institute of Justice’s research report Convicted by Juries, Exonerated by Science illustrated this facet (Connors, Lundregan, Miller and McEwan, 1996). The report examined 28 cases where individuals who had been convicted of rapes or rape/murders, some of whom were on death row, were eventually released due to the reassessment of their cases using DNA evidence. On average they had spent seven years in prison. The report analysed reasons for the initial wrongful convictions in an effort to elicit policy implications that would improve the accuracy of future court findings.

Reasons for wrongful convictions were found to include the unreliability of eyewitness testimony. In every case excepting murders, eyewitnesses had made incorrect identifications. Non-DNA tests of evidence such as serology, or analysis and comparison based broadly on blood groupings, “were proven less discriminating and reliable than those based on DNA tests” (Connors et al, 1996: 25). There were no accepted probability standards for human hair identification. Eight cases involved government misconduct, including perjured testimony, keeping of exculpatory evidence from the defence, and producing intentionally erroneous laboratory tests and expert evidence (Connors et al., 1996: 15-25). According to defence lawyers Peter Neufeld and Barry Scheck, “there is a strong scientific basis for believing these matters represent just the tip of a very deep and disturbing iceberg of cases” (in Connors et al. 1996: xxviii; refer also to “Exonerating the Innocent” in Chapter 11 of this thesis).

In April 2001, the exoneration by the Queensland Court of Appeal through DNA in relation to a rape conviction prompted an investigation and subsequent report, Forensics under the Microscope, by the State’s Crime and Misconduct Commission (CMC: 2002). By late 2004, this conviction was the only such reversal recorded in Australia attributed primarily to forensic DNA. The CMC report was presented in two chapters. The first described the circumstances of the particular case, and found no basis for disciplinary or criminal proceedings against anyone. The second chapter
examined the position of forensic services in the State. It discussed the relationship between the Police Service and Queensland Health and their organisational structures; the manner of exchange of items of evidence; staffing, funding and training issues and models for delivering forensic science services.

Although the report compared different organisational structures for delivering forensic science services, it concentrated almost exclusively on the provision of DNA evidence for court use, largely omitting its expanding role as a source of crime intelligence for police. For example, it drew attention to how, “Providing forensic science services for the courts highlights a series of complex managerial and systemic issues…” (CMC 2002: 26). The report concluded by making recommendations intended to minimise the reoccurrence of similar miscarriages of justice. Further reference to this CMC report will be made in Chapter 11.

**Academic research in Australia on DNA evidence**

Two studies by Australian scientists on DNA evidence were conducted in the 1990s. Firstly, Jane Taupin in the Department of Criminology at the University of Melbourne authored an MA research thesis, *The Impact of DNA Profiling on the Criminal Justice System*, in 1994. Taupin’s objective was to evaluate the effects of the introduction of DNA profiling in Victoria on a number of key points in the criminal justice system. Her method consisted of comparing and contrasting four groups of cases (A, B, C and D) in three time frames. In Group A all 97 cases were DNA profiled; two control groups, B and C held 78 and 112 cases respectively that were not DNA profiled; Group D held 101 cases, 46 of which were DNA profiled and 55 of which were tested using pre-DNA biological analysis methods. The cases covered a time frame from 1987 to 1991. Unlike the American studies, Taupin’s statistical analyses did not control for other evidentiary and socio-demographic variables like defendant confessions or race that might have influenced outcomes.

Taupin’s findings were that the overall impact of DNA profiling on criminal justice was low, as determined by the small percentage of criminal cases where the technique was utilised. Most often, DNA profiling was used for sexual offence cases. In certain types of cases, its impact was measurable, notably sexual offences committed by
strangers. There was an increase in guilty pleas for stranger type offences where DNA profiling was used. A comparison of cases before and after the advent of DNA profiling indicated some emerging trends, although these were not statistically significant.

After the introduction of DNA profiling for sex offences, there were more solved cases, more guilty pleas and fewer trials, although more individuals were drawn into the investigative process. The number of trials of sex offences in which consent was an issue, as distinct from trials where the issue was identity, was slightly greater than previously. The increase in guilty pleas with DNA profiling was restricted to the type of offences involving strangers; while, overall, less than one quarter of sexual offence cases that were DNA profiled resulted in a contested trial. This latter outcome led to the recommendation from the thesis that the focus of DNA profiling in the criminal justice process should be directed towards the investigative phase.

In late 1999, Jane Davies completed a thesis, *The Impact of Forensic DNA Profiling Technology in the Australian Criminal Justice System: a Critical Evaluation*. This thesis was submitted as part of a Bachelor of Biomedical Science degree with Honours in the School of Biomolecular and Biomedical Science at Griffith University, Queensland. The thesis briefly outlined the history and evolution of forensic DNA methods and it evaluated current forensic DNA profiling technology. It examined a variety of forensic DNA profiling systems, including Restriction Fragment Length Polymorphism (RFLP), Polymerase Chain Reaction (PCR), Mitochondrial DNA Sequencing, Short Tandem Repeat Polymorphisms (STRP), and the ampF/STR Cofiler and Profiler Plus PCR amplification kits.

As part of her thesis, Davies also interviewed defence and prosecution barristers, and examined the concept of admissibility of expert scientific evidence and its understanding by juries. She outlined the federal government’s CrimTrac project including legal, ethical and privacy issues related to DNA profiling and to databanks. The thesis also conducted a cost benefit analysis, estimating expenditures on court administration, police services and forensic biology costs. This was balanced against the projected benefits of the National DNA criminal investigation system, which was
based on international experiences, its possible effects on recidivism and crime prevention, and associated monetary savings.

While the thesis did not utilise primary data from criminal cases, it drew on the UK experience to support the view that using “DNA is….a speedy, economic and effective way of identifying suspects and linking crime scenes. It has shortened some major crime investigations, and reduced the financial cost and human suffering involved” (Gunn, 1998 quoted in Davies 1999: 119). In the UK, the DNA database allowed the investigation of crimes that previously would not have been investigated at all. The benefits of DNA and its impact on criminal cases were also illustrated by interviews conducted with two barristers: Paul Rutledge, then a Consultant Crown Prosecutor for the Office of the Director of Public Prosecutions; and Dennis Lynch, a barrister-at-law who conducted Defence work in private practice, and who had held the position of Deputy Public Defender with Legal Aid. Davies suggested that a quantitative assessment be made of the effectiveness of the national DNA database after an initial period of implementation. Such an assessment could examine crime solution and reduction rates, police resource usage and investigative approaches, and effects on court resources.

**Studies on DNA databases**

In 1999, Martin Gaule, then Scientific Support Manager of the Sussex Police in the UK, produced a report in conjunction with the Forensic Science Service (FSS): *Identifying the Effects of Timeliness of DNA Crime Stain Analysis on Resultant Detections*. This pilot project formed part of the evaluation of forensic DNA by police in the UK, and was undertaken because the Sussex Police began to question the value of the national DNA database that had commenced operation in April 1995. Due to a backlog in the UK in 1997, both in processing crime scene samples and samples from suspects, investigating officers were finding that suspects whose names were supplied in relation to matches or links had either already been identified, had already been dealt with for the offence in question, or were serving custodial sentences for other offences.
In Gaule’s study, a pilot group of 308 crime scene samples was processed through the forensic laboratory with a turn-around time of 28 days, and the conviction rate from the associated identifications was ten percent compared to two percent for a control group of 300 samples with no turn-around time constraints. The cost of investigations for the pilot group was 65% of that for the control group, while the rate of guilty pleas for the pilot, mostly property crime offences, was considered high at 80% – although no comparison was made with rates of guilty pleas in non-DNA cases. Gaule found “the early identification of suspects allows further evidence to be gathered and/or alibis to be refuted, thereby increasing the chances of a successful conviction” (Gaule, 1999: 2). Gaule’ conclusion about reduced costs through DNA is referred to later in this thesis in Chapter 9.

The UK Association of Chief Police Officers (ACPO) and the Forensic Science Service incorporated Gaule’s study into a 1999 research report *Evaluation of DNA* (Speakman, 1999). This project included a survey of police investigators to determine the outcomes of the DNA cold links supplied by the FSS in relation to volume crime. Questionnaires were sent to police forces, of which the England and Wales has 43, regarding the outcomes of a sample of 900 selected links, and 427 responses were received. The authors cautioned in the report, “The research covers a period of time when the interrogation of the databases was prolonged due to a backlog of cases”. A further caveat when assessing results was:

> The forces which responded well to the questions posed in the Volume Crime Questionnaire are likely to be those which have established effective systems for DNA as a whole, and thus the findings may reflect a more positive picture than it is realistic to expect for the whole service (Speakman, 1999: 4).

The 427 cases surveyed resulted in 130 convictions, which equates to a 30% conviction rate for matches or cold hits in volume crime cases. Despite positive database matches, suspects were not located in 29% of the crimes. In 69% of the cases where suspects were located (211 of 304), DNA provided the essential link; and in 78% of those cases it was the only means through which a link was made. Of the offences, 94% were burglaries, motor vehicle thefts or wilful damage. A further
factor to be considered in relation to the effectiveness of the hit rate is the “multiplier
effect”. For some links from the database, charges in addition to the particular crime
result. For the 427 links in the survey, the multiplier effect was 1.4. That is, from
304 suspects located through the 427 links above, charges were laid for 434 offences.
Data from this evaluation, along with that of Blakey (2000a), indicated that a
conviction rate of less that one percent of reported burglaries was achieved through
DNA. The report also provided summaries of 56 major crimes – mainly rape, murder
and abduction – where DNA was instrumental in linking a suspect to the crime, in a
number of cases through cold hits (Speakman, 1999: 4-5).

Following the ACPO report, Her Majesty’s Inspector David Blakey (2000a) produced
Under the Microscope: Thematic Inspection Report on Scientific and Technical
Support. The inspection examined how police aimed to use scientific support to
reduce volume crime, particularly burglaries and car thefts, and resulted in
recommendations on how such services could be improved. Her Majesty’s Inspector
found the national attendance rate by Scenes of Crime Officers (SOCOs) of the
various police forces to examine burglaries of dwellings for DNA and other evidence
averaged 75%, with the best attendance rate being 84%. The percentage of UK crime
scenes attended where samples were recovered for DNA testing averaged three
percent nationally, with a maximum of 4.9% reached by some police forces. Of crime
scene samples submitted to the FSS for testing, close to half were linked to a name on
the database (Blakey, 2000a: 18-21).

Blakey outlined the purpose and direction of the report:

[It] deals less with overall grand strategies for forensic science and
technical support than with simply getting the basics right. These
basics of integrating forensic science into mainstream policing,
visiting the scenes, collecting the evidence, making identifications,
acting on them and gathering intelligence are not intrinsically difficult
to secure. The service can and must tighten systems and procedures to
get the basics right: the future for crime reduction through the use of
forensic science and technical support can indeed then be bright
(Blakey, 2000a: xii).
The inspection report concluded with 16 recommendations intended to improve the effectiveness of scientific support services to police, particularly with the aim of reducing volume crime (Blakey, 2000a: 84-86).

In a follow-up report two years later, Blakey (2002) reviewed outcomes of the implementation from his first report, based on a questionnaire distributed to ten police forces in England and Wales. He found improved timeliness in the submissions of DNA samples, but an emerging problem was that multiple false identities were appearing on the national DNA database. His recommendations included that ranking officers become more active proponents of the scientific support function (Blakey, 2002: 16-23).

Across the Atlantic, Paul Tracy and Vincent Morgan, of the University of Texas, published a criminological study that relied on quantitative data and specifically addressed the crime and cost effectiveness of DNA databases both for investigative purposes and in the courts (Tracy and Morgan, 2000: 635-690). In *Big Brother and his science kit: DNA databases for 21st century crime control?* They pointed out:

> The ultimate value of a crime-fighting measure depends, not upon theory, or exaggerated speculations, or even anecdotal accounts, but rather on real world effectiveness of the technique. Thus, collection and study of empirical data is crucial to evaluating the advantages and disadvantages of such methods (Tracy and Morgan, 2000: 643).

At the same time, they condemned the celebratory rhetoric of senior police officers who hailed DNA as one of the most important developments in law enforcement for the 21st century as “unsupported assertion, if not blatant exaggeration” (2000: 638). Their criticism led, in turn, to a self-confessed “healthy skepticism” about the crime control value of amassing criminal DNA samples in databases at a public cost of tens of millions of dollars (Tracy and Morgan, 2000: 637). They examined the effects of DNA evidence and databases on serious offences and on property crime, and the use of DNA evidence by prosecutors. Their methods included using published FBI statistics and evaluating police procedures at crime scenes.
For property or volume crime offences, they concluded, “it is highly likely that these do not occur with much trace evidence (even fingerprints) left at the scene” (Tracy and Morgan, 2000: 648). Additionally, they found that police did not have the resources to examine thoroughly all volume crime scenes for biological evidence. For major crimes like homicide, sexual offences and serious assaults, they concluded, “DNA databases will not be greatly successful in increasing the extent to which police solve the vast majority”. Their reason for the latter finding was that there was already a high rate of solution for serious offences which DNA would not improve substantially: “law enforcement already does a more than creditable job in solving three out of four violent crimes” (Tracy and Morgan, 2000: 650).

The overall conclusion they reached was that DNA databases were largely ineffective, both in terms of crime control and on cost-benefit grounds, and that databases should be directed only to specific categories of criminals like violent offenders and sexual predators. They drew attention to the implications for privacy and the personal liberty issues and suggested a huge potential for abuse of the databases in these areas (Tracy and Morgan, 2000: 685-690).

Despite commencing operations in April 1995, the inaugural Annual Report on the United Kingdom’s National DNA Database did not appear until October 2003, and related primarily to the year 2002-03. The Report provided an overview of relevant UK legislation including the Criminal Justice and Public Order Act 1994, the Criminal Justice and Police Act 2001 and the Criminal Justice Bill; it outlined the management arrangements for the National DNA Database, and provided statistics on crime scene samples and criminal justice (CJ) samples (swabs from individuals) received. Numbers of matches achieved through the database were reported, along with security measures and scientific and quality assurance controls (Forensic Science Service, 2003). A summary of financial affairs for the database was included in the Report, as well as information about its effects on crime reduction. Some recent special initiatives involving database applications were mentioned. In the section entitled “Impact on crime reduction”, the report noted:
In 2002-2003, the police attended 998,000 crime scenes, recovered potential DNA material from 100,000 of these and put profiles on the Database for 57,000. The police also added 405,000 CJ sample profiles to the Database and obtained 21,000 potential detections. The probability of identifying one or more suspects for an offence, when a profile from a crime scene is loaded to the Database, is over 40%.

80% of matches for CJ samples related to offences different from the initial arrest offence for which the CJ sample was taken and a growing number of matches involving serious crimes followed initial sampling for minor offences. ……. For domestic burglary, the detection rate increased from 14% to 44% when DNA was available. Each crime detected with DNA led to 0.8 other crimes being detected and the Home Office estimated that some 50% of detections led to convictions, 25% of these led to custodial sentences and each custodial sentence prevented a further 7.8 crimes being committed (FSS, 2003: 26).

The FSS Report concluded that these figures justified police taking DNA samples from as wide a range of suspects as possible (2003: 26).

One of the special initiatives referred to related to police operations in 2002-03 aimed at burglary reductions in Leeds, West Yorkshire and the West Midlands. Of 5,367 profiles submitted to the FSS, 3,280 matches were achieved through the database. Significantly, in a process where timing has been shown to have a critical impact on outcomes such as conviction rates, the Service issued match reports within three hours of the profiles being submitted for loading into the DNA database.

Another initiative was the solving of the murders of three teenage girls in south Wales from 29 years previously through familial searching, a technique based on the fact that related individuals are statistically more likely to have similar DNA profiles. A full DNA profile common to all murders was isolated and searched against the database, but when no matches resulted, a search was made to find persons who, from
their DNA profile, might be related to the murderer. By combining the names of these people with information from the investigations, a deceased man, Joseph Kappen, was eventually identified as the prime suspect. Kappen’s body was exhumed, and “DNA tests on his remains showed a perfect match with samples obtained from the bodies of the three dead girls” (FSS, 2003: 24-5).

Official research and publications in Australia

In 1990, criminologist Dr. Patricia Easteal (1990) proposed a national Australian DNA database, and by 1995 the Standing Committees of Attorneys-General had drafted a legislative framework, the *Model Forensic Procedures Bill* (Nearhos and Bowman, 1999: 10). By 1998, the federal government offered funding for such a database through the CrimTrac organization. Prior to, and following legislation in 2000 by the various States to facilitate DNA sampling, various State Parliaments, Ombudsmen and Privacy Commissioners produced a number of government publications with the objective of informing debate on the topic (see for example, Griffith, 2000; the New South Wales Ombudsman, 2001; the Australian Law Reform Commission, 2002; the Office of the Federal Privacy Commissioner, 2001 and 2002; and the Office of the Victorian Privacy Commissioner, 2002). The Queensland Parliamentary Library published a *Legislation Bulletin*, selected for review here, as being of particular interest as Queensland was the State where primary data for the present research were gathered (Green, 2000).

The Queensland publication explained the composition of DNA, its forensic uses and how DNA is profiled. It then outlined issues related to the proposal for a national DNA database in Australia, and summarised the perceived advantages and disadvantages. Advantages listed included increased crime clear-up rates, more focussed investigations, exclusion of suspects and exoneration of convicted offenders, and deterrence and reduction in crime and costs. It then examined privacy issues, increases in police powers, and developments in DNA profiling and databases in the United Kingdom, the United States and Canada.
The *Bulletin* went on to describe the Model Forensic Procedures Bill that was compiled by the Model Criminal Code Officers Committee (MCCOC) of the Standing Committee of Attorneys-General and the resulting discussion paper. The *Bulletin* also mentioned the role of the federal agency, CrimTrac, in co-ordinating the sharing of DNA profiling information among States. It reviewed the common law and legislative position in Queensland at the time, and then compared the Queensland Bill with the Model Bill, and with forensic procedures legislation in other States and the Northern Territory. In its appendices, the *Bulletin* compared international legislation from New Zealand, Canada, the Netherlands and the United States, and reproduced a number of excerpts from newspapers and letters to editors intended, presumably, to inform readers and to stimulate debate, although no amendments to the Bill were subsequently moved in the House (Ede, 2003).

The *Bulletin*, however, contained a number of unsubstantiated or exaggerated claims as well as inaccurate information. Among the former was the claim, sourced to a *Courier-Mail* daily newspaper article that, “the success rate in finding the criminal responsible for property crimes in the UK increased from 12 to 40% virtually overnight when a DNA sampling and national database was established” (Green, 2000: 8; Koch, 1999: 1). Studies conducted in the UK in 1999 for the Association of Chief Police Officers by Gaule and Speakman, reviewed earlier in this chapter and examined later in Chapter 8, showed that a one percent conviction rate on reported burglaries was being achieved through DNA, and provided no basis for this claim.

Another such claim was, “about 25% of all break and enter persons cut themselves on glass and, since most are repeat offenders, almost all leave their DNA at crime scenes” (Green, 2000: 8). Figures from studies in the UK and in New Zealand are consistent in finding that only three to five percent of burglaries yield trace DNA evidence, this being from a variety of sources as well as from blood (Blakey, 2000a: 18-21; Walsh, Moss, Kliem and Vintiner, 2002: 212; Forensic Science Service, 2003: 26). Three years later, the projected cost savings claimed in the *Bulletin* had not materialised, as the government was required to provide $11 million towards clearing a backlog of crime scene samples held at the forensic biology laboratory (Australian Labor Party, 2004: 3)
The *Legislation Bulletin* quoted American experiences with exonerations and exclusions (2000: 9-10), the implication being that these would apply in Australia. Partly through DNA, more than 60 innocent persons had been exonerated after conviction in the United States to that time. Despite this, the draft Queensland legislation made no provision for establishing or for funding innocence panels, and by late 2004 only one appeal that relied on DNA evidence had ever been upheld in Australia (*Frank Alan Button v. R.* [2001] QCA 133). DNA was found in the US to exclude about 25% to 33% of suspects, and the inference could be drawn that the same would apply in Australia. Forensic scientists in Australia at the time were well aware of this discrepancy (Grice, 2001), and a published pilot study for this thesis found that in Queensland DNA excluded around only two percent of suspects (Briody, 2002: 24-5). The proposed legislation was notable for its omissions, such as lacking any provisions for mass testing or for covert sampling, and will be further critiqued in Chapter 11. Overall, the research on which the *Legislation Bulletin* was based reflected either the absence of reliable data due to a lack of quantitative criminological studies on forensic DNA, or the selective presentation of information favouring a case that would help gain support for the Bill in the House.

In May 2002, Jeremy Gans and Gregor Urbas (2002) authored a *Trends & Issues in crime and criminal justice* paper for the Australian Institute of Criminology, *DNA Identification in the Criminal Justice System*. The paper outlined the uses of DNA as identifying evidence and described how DNA profiles were compared in laboratories, including use of the common standard Profiler Plus kits used in Australia. It discussed the investigative results of matching, and cautioned against false inclusions, citing examples in the UK and in New Zealand, where individuals had been investigated as a result of laboratory matches that were later discredited (for details, refer Chapter 10). The paper examined how DNA evidence should be presented in court before juries, and summarised some general principles established in Australian courts. It also provided information on the introduction of DNA evidence in post-conviction reviews of cases, and of the concept of establishing Innocence Panels to assist wrongly convicted persons.
In September 2002, the only paper encountered that dealt specifically with the effects of forensic DNA on Australian minority groups appeared. *DNA Forensic Procedures: Potential impacts on Victoria’s Indigenous community* was a Parliamentary Library Information paper authored by Greg Gardiner (2002). The paper pointed out that Indigenous people could benefit from any advantages that might flow from DNA as used in the wider community, such as clearing of suspects during investigations, or a general reduction on crime rates if such were to occur. Further, if DNA were to lead to increased detection of offenders, Indigenous women, who are over-represented as victims of violent crime, could be beneficiaries. The paper drew attention to Commonwealth and New South Wales legislation that made particular provisions for the conduct of forensic procedures or sampling in relation to Indigenous persons, such as the presence of interview friends and legal representation, and time limits for performing procedures. The paper noted the absence of similar provisions in Victoria’s laws, and recommended their adoption.

Potential negative impacts of forensic DNA were in relation to the disproportionate levels of contact that the Indigenous community experienced with the criminal justice system. The paper cited how young black males were over-represented for arrests and incarcerations in a host of jurisdictions. The impact of forensic DNA procedures could result in increased levels of contact with the justice system, and consequently the perception that the Indigenous community was being unjustly singled out for attention. The retention of DNA samples and profiles could confer a “suspect-for-life” status on young Indigenous males, contrary to the notion of, and current focus on, rehabilitation in juvenile justice. The retention of genetic material from any particular community was identified as an area of ongoing interest and concern, although the Victorian Forensic Science Centre had indicated that it had no knowledge of the racial or ethnic character of the samples it analysed (Gardner, 2002: 3-4).

The Victorian Parliament Law Reform Committee (VPLRC, 2004) conducted an exhaustive investigation into forensic DNA that was initiated in late 2001 and culminated in 2004 with its 517-page report, *Forensic Sampling and DNA Databases in Criminal Investigations*. The Committee believed it time “to revamp the legislative and administrative framework in which DNA profiling is conducted”, in order to
provide a framework for future developments (2004: xxx). It considered submissions from a broad range of interested parties during its deliberations. The collection and use of DNA samples in Victoria is regulated through Subdivision 30A of the *Crimes Act 1958 (Vic)*, which is largely consistent with the model forensic procedures developed for Australian jurisdictions. The report contained numerous recommendations governing conditions under which DNA samples and profiles could be obtained, entered on the database, or destroyed.

Among the more important recommendations on legislation were that a purpose clause be included to prevent the use of samples taken for forensic comparison purposes to be used for any other purposes, and that DNA samples be destroyed as soon as practicable after a profile had been obtained. The report also recommended that a protocol be established for the destruction of profiles that would be practical and which would satisfy the privacy concerns of donors. It suggested that all sample donors receive clear standard information explaining the nature, purpose and implications of the sampling procedure, and that the sample donor, rather than a police officer, choose the type of sampling procedure to be used (for example, buccal swabbing or hair or blood removal) (VPLRC, 2004: xxix-xlvi).

The Committee further recommended that research be conducted into recidivism, so that collection of DNA samples could be targeted at those most at risk of re-offending, and that all adults found guilty of serious indictable offences be automatically sampled, the exception being incapable adults. The Committee believed that if offenders did not re-offend for a specified period, their profiles should be removed from the database, and that suspect’s profiles be removed from the database and their samples destroyed after 12 months if they were not charged or if acquitted. The report also addressed the issues of integrating Victoria’s sampling regime and database into the national CrimTrac model, the necessity for the independence of forensic laboratories, the need for hard data about the contribution of DNA profiling to crime detection and to criminal investigations, and support for the concept of post-conviction reviews or Innocence Projects (VPLRC, 2004: xxix-xlvi). The report could well benefit other jurisdictions for policy-makers contemplating issues associated with forensic DNA.
Forensic DNA and social issues

A number of the social implications of forensic DNA were examined during a conference at Harvard University’s John F. Kennedy School of Government in 2003. Fifteen papers, delivered by academics from throughout the US, were published as The Technology of Justice: DNA and the Criminal Justice System (Lazer ed., 2003). The conference was particularly concerned with broad social policy determinations, such as the scientific/legal interaction, the effects of major advances in genetics, and the question of their regulation. It examined how the law would reflect social policy in the light of scientific developments, the re-shaping of the boundaries of pre-existing legal rights to better avoid the risk of imprisoning a defendant whom DNA may indicate as innocent, the possible need for new statutes, the privacy issues involved with familial DNA database searching, the legality of genetic discrimination that may arise from DNA testing and the ownership of the DNA profiles or samples held.

Particular presentations addressed topics that included current use and future directions of the technology (Beiber, 2003), the relative priority that should be given to trial stage DNA (Imwinkelreid, 2003), the potential contribution of fingerprint science to DNA debates (Cole, 2003), genetic privacy (Annas, 2003), ethical and policy guidelines (Charo, 2003), how extensive should DNA databases be (Kaye and Smith, 2003), privacy and DNA databases (Steinhardt, 2003), the rights of individuals versus the public interest (Etzioni, 2003) and DNA databases and informational privacy (Mayer-Schönberger, 2003). The conference website was also linked to DNA database and databank legislation in 50 US States, and contained links to a series of magazine and newspaper reports from 2001 and 2002 that discussed DNA issues. Material from the conference largely relates to Part C of this thesis, where Chapters 10 and 11 consider issues of privacy and civil liberties, and how these may be balanced with crime control objectives.
Forensic intelligence

During and post-2000, research on the application of forensic DNA, which until then had largely been concerned with the areas of science and the courts, shifted its focus to police investigations. The challenge became how to maximise the productivity of the matches that DNA databases were producing, particularly in the UK, where the national database had an output of several hundred matches per week. It was found that these matches or links were most effective when integrated into police intelligence systems where they could act in concert with other information such as matches from fingerprint (AFIS) databases, with other forensic information like footmarks and tool marks, and with forensic and non-forensic intelligence like suspect interrogations that can provide links among known offenders.

In the UK since 1998, the West Midlands Police have been developing Forensic or Force Led Intelligence Systems (FLINTS) – a computer software program incorporating a Geographical Information System (GIS). The system links places to people, and people to other people to crime, through forensic, crime and intelligence databases. It can be updated very rapidly and communicated to police on the streets to provide a basis for action. FLINTS has been described in a number of articles (for example, Leary, 2002; Leary and Bailey, 2003). According to Assistant Chief Constable (Intelligence), Nick Tofiluk, of the West Midlands Police, “discovering these links has resulted in thousands of hours saved in the management of forensic intelligence … resulting in hundreds of crimes being solved and criminals convicted” (2003a: 23).

No control-comparison studies were available that evaluated FLINTS; that is, studies where results achieved through FLINTS were compared to previous crime levels or to areas where FLINTS was not used. However, the 2003-04 Annual Report of the UK’s Forensic Science Service noted how, “a burglary reduction initiative within the West Midlands saw crimes reduce by 10% compared to a national average increase of 1%” (FSS, 2004: 11). The FLINTS program is more fully detailed in Chapter 8 of this thesis under the heading “Forensic-led intelligence”, and a précis of the system constitutes Appendix B of this thesis.
Walsh, Moss, Kliem and Vintiner (2002) have described a New Zealand DNA Intelligence Project, a collaboration involving forensic and law enforcement agencies, in their article, “The collation of forensic DNA case data into a multi-dimensional intelligence database”. Case data held on the New Zealand DNA database were entered into a functional intelligence database that could be interrogated to reveal the geographical distribution of crimes, the level of usage of DNA samples in investigations and the identification rates achieved. By linking individuals to crimes outside their residential areas, the Project could identify locations that were sources for offenders. It found a match rate, or proportion of crime scene samples that were linked to an offender by the database, of 42%, while in three percent of reported burglaries a DNA sample was submitted for testing.

The New Zealand study sampled seventeen cases involving 50 burglary charges, five rape offences and one homicide, and found that in all cases but one the defendant pleaded guilty, and concluded, “pursuance of DNA Databank matches will lead to the swift and cost-effective process of cases through the criminal justice system” (Walsh et al. 2002: 213). In the longer term, the Project’s stated aim was to integrate forensic science more fully with intelligence-led policing concepts that focus on strategies for preventing and reducing crime, rather than merely using forensic science to retrospectively analyse criminal events (Walsh et al. 2002: 213-4).

The beginnings of a theoretical framework for forensic-based intelligence systems have been explored by Ribaux, Girod, Walsh, Margot, Mizrahi and Clivaz (2003) in their article, “Forensic intelligence and crime analysis”. Apart from Simon Walsh at the University of Technology, Sydney, the authors were from the University of Lausanne, Switzerland. The article’s authors drew attention to the potential of other sources of forensic intelligence in addition to DNA and AFIS fingerprint databases. Innovative approaches would allow shoe marks, tool marks, glove marks, items left by an offender like clothing or accessories, or information captured on surveillance cameras, to provide information and links among offenders and crimes. Clusters of such evidence could be isolated, and if concentrated within geographical locations or within delineated time periods, they may reveal a series of potential links among crimes. The paper contended that, generally speaking, forensic case data remained poorly integrated into the crime analysis and investigative processes. It proposed that
rather than aiming to develop systems similar to DNA databases or to AFIS, the research agenda should consider pooling forensic data from all sources into a comprehensive model (Ribaux et al., 2003).

In mid-2004 the New South Wales Bureau of Crime Statistics and Research (BOCSAR) published the first in a series of studies intended to evaluate the effectiveness of police operations in an effort to assist police to develop a more evidence-based approach to crime control (Jones and Weatherburn, 2004). This first evaluation scrutinised an operation code-named “Vendas”, the aim of which was to determine whether it was possible to reduce break and enter offences and motor vehicle thefts in three Local Area Commands (LACs). The aim was to be achieved through the collection of forensic evidence such as DNA and fingerprints, and by dedicating more resources to developing intelligence and follow-up criminal investigations based on this evidence. The two primary mechanisms that the operation relied on were to increase the risk to offenders of being intercepted by police, and secondly, to improve the overall speed of arrests. The operation adopted three main strategies in order to improve the speed and volume of arrests: increasing the attendance at crime scenes; reducing the time in which forensic identifications were notified to investigators; and prioritising the arrest of offenders identified through forensic DNA and fingerprint evidence (Jones and Weatherburn, 2004: vii).

The operation ran for seven months during 2003, and results were compared with crime levels for the same seven months during the previous year in the same LACs, and also compared with crime levels in the remainder of the State for the seven months in 2003 during which the operation. The report evaluating the operation concluded:

…there was no indication that the volume of BES [break, enter and steal] or MVT [motor vehicle theft] offences decreased in any of the LACs as a consequence of Vendas. Nor did the analyses reveal any increase in the rate of arrest for these types of crimes in any of the LACs (Jones and Weatherburn, 2004: vii).
The Director of BOCSAR cautioned that the result should be treated as a provisional finding, and that it may take years of evaluated trials and research to develop effective remedies to such crimes (Weatherburn, in Jones and Weatherburn 2004: iii). The conclusion of this report is considered particularly significant as the evaluation was conducted by an external independent agency using advanced statistical methods. The implications of the findings from Operation Vendas are further explored in Chapter 8.

**Hypotheses to test**

As the intention of this thesis was to assess the effectiveness of DNA evidence in the justice process, it was reasoned, as explained in Chapter 1 above, that a quantitative approach would provide the most scientifically valid results. The availability of data relating to the use of forensic DNA in two phases of the justice process – the investigative and the adjudicative – was examined when the research commenced in 1999. Because the research was based in Queensland, data from that State were selected for use due to ease of accessibility.

DNA commenced being used in Queensland courts in 1991, and it was found that a statistically sufficient number of cases had accumulated in the intervening years to allow analyses of the effects in court from primary data. These analyses constitute Chapters 4 to 7 of this thesis. Data on the use of DNA in police investigations, particularly in the form of matches or cold hits from DNA databases, did not become available until much later. Australia’s national DNA database did not become operational until March 2003, so instead of local data, secondary data from the United Kingdom, where the world’s first national DNA database began operating, were largely used. Chapter 8 provides an assessment of DNA use in police investigations and as a form of crime intelligence.

Although nearly all of the research reviewed above was not available at the commencement of this thesis in 1999, the general supposition was made at that time that DNA evidence could contribute to the efficiency and effectiveness of criminal court processes. It was therefore decided to test the following general hypotheses about the effects of DNA evidence on the court processes:
• That a higher proportion of cases reach court where DNA evidence is presented by prosecutors;
• That more guilty pleas result where suspects are confronted with DNA evidence associating them with complainants or crime scenes;
• That a significant relationship exists between DNA evidence implicating the accused and the likelihood of a conviction;
• That incriminating DNA evidence is associated with more custodial penalties;
• That longer custodial penalties are imposed where incriminating DNA evidence is presented.

The hypotheses relating to the sentencing phase were included as a result of studies on the effects of forensic evidence in the United States prior to the use of forensic DNA testing. These studies concluded that, “forensic science reports and testimony have their greatest impact at the time of sentencing, when convicted defendants are more likely to go to prison and for longer periods of time where scientific evidence is presented” (Peterson et al., 1987: 1730). Sentencing in Australia, however, is conducted in a different legal context to that in the US, where juries play a role in some sentencing decisions. In Australia they play no such part.

To assess any impact the DNA might have on the investigative process, it was decided to research the hypothesis that DNA databases, when used as a police intelligence source, could reduce volume crimes like burglaries and car thefts.

CONCLUSION

This chapter initially reviewed overseas pre-DNA research on forensic evidence from the 1980s. Studies from the United States found that forensic evidence made a significant impact on court processes, while a UK Home Office study concentrated more on the use of forensic evidence in police investigations. The US study was one of the few located that examined thoroughly the effects of forensic evidence on the court process. The ability of DNA to help reconstruct crimes and its use in exonerating convicted innocent persons was the subject of an important 1996 American publication, while the one such case in Australia prompted Queensland’s
Crime and Misconduct Commission in 2002 to produce a report on that case and to review the structure for forensic services delivery in the State.

Only two academic research studies in Australia on forensic DNA in the justice system were located, but a number of studies by police and by the Forensic Science Service in Britain about the use of DNA in investigations were reviewed. These studies, such as that of Blakey, evaluated DNA usage levels, and made recommendations to improve its impact on crime. Relevant to DNA sampling laws that were passed by Australian legislatures in 2000, were a number of publications by parliaments, Ombudsmen, Privacy Commissioners and Inquiries. One such publication, a legislation bulletin produced by the Queensland Parliament, was reviewed, but some quantitative information it contained was judged to be inaccurate. Only one study, from Victoria, was found to deal specifically with the effects of forensic DNA on Indigenous persons. The social and privacy implications of forensic DNA profiling and databases were best covered by a conference at Harvard University in 2003, and the topics of the papers presented there were outlined. The inclusion of DNA database information in police intelligence systems, such as FLINTS, to improve productivity, was also discussed. The results from a report on a New South Wales police operation that attempted to achieve volume crime reductions through forensic science was regarded as significant, as the evaluation was conducted by an external agency and used a control-comparison method. Lastly, hypotheses derived from the literature review, and that would be tested in the course of this thesis, were listed.
PART B – CASE STUDY ANALYSIS
SYNOPSIS OF PART B

Part B contains the original research, largely based on primary data, for this thesis. Chapters 4 through to 7 relate to the effects of DNA in criminal courts. DNA was found to be used most commonly in four main offence categories, and each of those categories relates to a chapter. The categories were sexual offences, homicides, serious assaults and property crimes. In each chapter, primary data from criminal cases in Queensland were analysed to evaluate the effects of DNA evidence using a control-comparison approach. In all cases sampled the DNA evidence was used for prosecution purposes.

All four chapters follow a similar layout, and utilise the same statistical techniques. The analyses aim to determine the effects of DNA evidence on decisions by a number of parties in the courtroom. These include decisions by prosecutors on whether or not to prosecute cases, decisions by defendants on whether or not to plead guilty, decisions by juries on whether to convict or to acquit, and decisions by magistrates and judges on sentencing. Sentencing decisions that were analysed were examined to determine whether or not DNA acted as a predictor of custodial sentences, and in the case of imprisonment, whether DNA evidence was associated with the length of the sentence.

In all four chapters the statistical methods applied are explained, so that each chapter may be read in isolation. Alternatively, if the chapters are approached consecutively, the repetition in the explanation of the methods is apparent. However, this relatively uniform statistical approach to the four offence categories was deemed desirable so that cross-comparisons between different offence types could be conducted.

Chapter 8 departs from the pattern set in Chapters 4 to 7 and examines the effects of DNA databases on property crimes, like burglaries and car thefts, relying on data from studies done in the UK and in New South Wales. This topic was deemed of interest because legislation enabling extensive DNA sampling of individuals was introduced on the basis that it would target such offences.
CHAPTER 4: EFFECTS ON SEXUAL OFFENCE CASES IN COURT

INTRODUCTION

The handling of sexual offences by the criminal justice process in Queensland has been a focus of attention in recent years (Crime and Misconduct Commission, 2003). This chapter examines the effects that DNA evidence had on decisions in such cases as they progressed through the criminal courts: on decisions to prosecute, on decisions by defendants about whether or not to plead guilty, and how it assists juries and judges in decisions about guilt or innocence. Its association with custodial penalties is also examined. These effects were assessed within a context of other evidentiary and extra-legal factors that may also have a bearing on case outcomes. The primary method relied on was an archival study of case records. This involved comparing the characteristics of criminal case records from two different categories, those that were referred to the forensic laboratory, and for which a scientist provided a sworn court statement that associated the defendant with either the complainant or the crime scene, and similar cases for which no DNA evidence was presented in court. A sample of 200 cases, considered solved by police and completed to the appeal stage in the jurisdiction of Queensland, was selected for examination. Approximately half of these cases utilised DNA evidence, while the other half did not. The differences that DNA evidence made, if any, were then assessed by comparing the characteristics of the DNA group cases to the control group at the various decision-making stages, while allowing for the other evidentiary and extra-legal factors that influenced case outcomes.

Court outcomes: Theoretical considerations

Theories have been postulated on the relative strengths of legal and extra-legal factors as influences on court outcomes. According to the approach favouring the predominance of legal factors, court decisions rely on the evidence presented in court. In turn, the rules of evidence determine which facts are admissible to be presented (Eggleston, 1978: 43-63). Social theorists, alternatively, place the court process in a...
broader social milieu and propose that extra-legal factors including income level, race, ethnic and cultural background and sex of all court participants can influence access to courts and court decisions (White and Perrone, 1997: 91-101). The counter-argument to this is that the rules of evidence exist to minimise the influence of social factors, through, for example, the careful selection of jurors, the admissibility of evidence and controls on questions by the prosecution and the defence.

While the reality of which factors predominate may lie in some combination of evidentiary and sociodemographic variables, the emphasis in this study is on assessing the position of DNA evidence in relation to other factors in the determination of the guilt or innocence of an accused, and its relationship, if any, to sentencing. This study therefore examined the effect of forensic DNA in comparison to some other types of court evidence, such as defendant confessions, testimony of independent eyewitnesses and photographic and fingerprint evidence. To allow for any possible contribution by social influences to court decisions, a number of demographic variables for defendants and complainants, such as age, sex, race and more, were collected for each case sampled, and then tested for significance while developing a statistical model.

Although previous research has included the effect of other variables, such as the sexual experience and the physical attractiveness of the victim, and the effects on court outcomes in the US of cross-racial rapes (Field, 1979), the present research utilised data that were available and considered most relevant to the offences studied. On the issue of race, examining the specific effects of forensic DNA on the Indigenous community was considered outside the scope of the present research, but a paper produced in Victoria, which was reviewed in the previous chapter, has addressed that topic (Gardiner, 2002).

**Hypotheses to test**

The hypotheses developed in Chapter 3 are reiterated below. They derive from conjecturing that DNA evidence could contribute to the efficiency and effectiveness of the court processes. Previous research by Peterson et al. (1984, 1987) and by Taupin (1994) suggests this. The hypotheses to be tested in this Chapter are:
That a higher proportion of cases reach court where DNA evidence is presented by prosecutors;

That more guilty pleas result where suspects are confronted with DNA evidence associating them with complainants or crime scenes;

That a significant relationship exists between DNA evidence implicating the accused and the likelihood of a conviction;

That incriminating DNA evidence is associated with more custodial penalties;

That longer custodial penalties are imposed where incriminating DNA evidence is presented.

Method

To analyse the effects of DNA evidence on the court process, a sample of 200 sexual offence cases was selected. As the study was based in Queensland, cases within the State’s jurisdiction were chosen because of the convenient availability of records. However, the findings may well apply to jurisdictions with a similar English-based adversarial legal system. Conditional ethical permissions were obtained from Queensland Health, whose Forensic Biology Section conducts forensic DNA analysis for cases throughout the state, and from the Queensland Police Service where the evidentiary and sociodemographic data was accessed through the Police Information Centre. Sentencing information was obtained from criminal history records, also held in the Police Information Centre.

From the forensic laboratory files, 102 sexual offence cases were selected, along with a control group of 98 similar types of sexual offence cases chosen through a search of computerised police records. This sample population of 200 cases was found to be of sufficient size in relation to the number of predictor variables to allow significant relationships to be calculated statistically (Tabachnick and Fidell, 2001: 521-2). The DNA cases covered offences that occurred between 5 July 1994 and 9 October 1999. The latest date was the most recent case for which court results were available when data were collected in 2001. Proceeding back in time, every available DNA case file was then scrutinised and included if it met the further selection criteria until a sufficient number of cases were obtained. To maintain parity with the DNA group,
the non-DNA cases were then chosen from within the same time bracket (to place
them in a contemporaneous social and legal environment) and to meet the same
criteria except for the second.

The selection criteria for the DNA cases were:

- that the cases be completed so that they could be tracked to finality in the
  justice process, that is, past the appeal stage in the courts;
- that a forensic laboratory scientist had produced a sworn court statement in
  which the defendant was associated through DNA profiling with either the
  complainant or the crime scene;
- that no defendants were subject to penalties for juveniles (which can be
different from those for adults);
- that police and court records could be located;
- that none of the cases involved the defence of consent at the time of the
  police investigation.

The last criterion was included because the Forensic Biology laboratory refuses to test
evidence in cases where suspects were recorded by police as admitting intercourse or
penetration, as DNA evidence would be of no probative value – that is, DNA
evidence would act only to confirm admissions by the suspect and should make no
discernible difference to case outcomes. If done, such testing would place an
unnecessary burden on scarce laboratory resources. Both DNA and non-DNA cases
selected for inclusion in the sample therefore, involved a range of other
circumstances: where defendants had made full admissions to police and confessed;
where defendants denied being involved in the alleged offence; where suspects
refused interviews with police or chose to make no statement (and therefore it was
unknown if consent would be used as a defence). When some of these latter cases
eventually reached court, the issue of consent, or belief of consent, was raised as a
defence.
Other cases eligible for selection in both DNA and non-DNA groups involved intellectually impaired complainants legally incapable of consent; criminal paternity cases; incidents where witnesses attested to non-consent; offences where complaints included domestic violence separation orders being breached; indications such as forced entry to dwellings where the offence occurred; victim assault injuries that were obvious to police or were medically diagnosed, torn clothing or bruising (collectively termed “tangible evidence” as a statistical category in this study); stranger sexual assault, and cases involving serial offenders. Eligible for inclusion too, were cases where complainants were minors. These constitute 58% of reported Queensland sexual offence victims (Legosz, 1999: vii). A Victorian study of 311 rape cases referred to the DPP by police in 1988-89 found that only 30 of those cases (10%) were defended in the County Court using consent or belief of consent as a defence (Law Reform Commission of Victoria, 1991: pp. 39, 86). Cases selected for inclusion in the present research would therefore constitute a significant majority of reported sexual offence cases regarded as solved by police.

The control group was selected firstly by assigning Crime Classification Codes as determined by the Australian Bureau of Statistics Australian National Classification of Offences to cases in the DNA group, based on the type of Most Serious Offence (MSO) reported in the incident. This resulted in cases being classified into eight types of offences. An equal percentage of similar offences with no DNA evidence presented was then located in each of the eight categories, so that parity of the two groups was achieved at the time of commencement of tracking the cases from the time of charging. For example, 71% of the DNA cases had rape as the MSO, so reported rapes constituted 71% of the cases selected without DNA evidence. Inevitably, variations occurred in the type or severity of charges laid as some of the cases progressed through the justice process, causing a slight divergence between the two groups. Reasons for this included the Office of the Department of Public Prosecutions (DPP) altering charges from those initially preferred by police, magistrates varying charges as they committed cases to the District Courts, and the reductions through charge bargaining.
As all cases in the DNA group involved male defendants, control group cases were also matched on this criterion, as female defendants may have fared differently in the justice system due to chivalric bias (Heidensohn, 1997: 778). The non-DNA cases also approximated the DNA cases on a geographical basis, both groups being similarly distributed throughout police districts in the State. Several hundred sexual offence cases were scrutinised in order to generate a suitably matching non-DNA group. It should be noted that the control group was not intended as a random sample, as was the DNA group (within the limits of the selection criteria), but rather, as a selection with characteristics matched to the DNA group in order to minimise any biases.

An important element of parity between both groups in the sample was a rating for the seriousness of the offences and for the number of charges laid when cases reached their final court hearing. This measure was of interest in order to pre-empt the possibility that only more serious incidents were referred for DNA testing. The eight level scale of offence seriousness, where eight was the highest in the hierarchy of offences (rape) and one was the lowest (indecent assault of an adult) was constructed based on the Australian Bureau of Statistics “order of seriousness of offence types” as set out in Appendix 6 of the Queensland Government Statistician’s publication Crime and Justice Statistics, Queensland, 1997 (1999: 58, 59):

1. Indecent assault of an adult
2. Sexual offence consent prohibited
3. Indecent treatment of a child
4. Assault with intent to rape
5. Attempted rape
6. Incest
7. Unlawful carnal knowledge
8. Rape.

The mean value of “seriousness”, based on the charges finally faced in the District Courts, was calculated on this eight level scale. For DNA cases this value was 6.75 and for non-DNA cases 7.29. These values were considered sufficiently close to achieve valid results, with the non-DNA cases, in fact, rating a higher degree of
seriousness. For DNA cases the average number of charges laid was 3.30, while for non-DNA cases the average figure was slightly higher at 3.42 charges. Typical examples of secondary charges in rape incidents were indecent assault, common assault and deprivation of liberty. These same offence categories were used in a study of the general statistical characteristics of reported sexual offences in Queensland by the State’s then Criminal Justice Commission (Legosz, 1999: 45-46).

The distribution of case seriousness was skewed heavily towards the more serious end of the scale, with 142 of the 200 selected cases (71%) being finally charged as rape offences in the District Courts. DNA technology achieved results in rape cases both because of the physical suitability where offenders’ bodily fluids such as semen were detected, and because of the seriousness of the offence, which encouraged police to refer such cases to the laboratory. This skewed distribution was closely mirrored in the non-DNA group, where 74% of the cases selected were finally charged as rape offences. The study was unable to account for any charge bargaining or plea-bargaining, and any effects on this of DNA evidence, as the records accessed did not include such details. However, it was found that in nearly all cases the most serious charge faced by the accused in court was the same as that originally laid by police. For the purposes of the later logistic regression analysis (Table 4.3), the eight-scale rating for the seriousness of the offence was collapsed into binary form. Offence types were therefore recoded as “other than rape” = 0 and “rape” = 1.

A listing of descriptors of the independent or predictor variables for the cases sampled is set out in Table 4.1, along with their means and standard deviations where meaningful. The independent variables are divided into four general categories: complainant variables, offence variables, evidence variables and defendant variables. Apart from where indicated on the table, most predictor variables were dichotomous, with the value of one reflecting inclusion in the category. As not all data were available for every case, one column indicates the number of cases for each variable where data could be located. The first variable listed relates to whether the complainant is male or female. This variable was ascertained in all 200 cases; the mean of 0.04 indicates that eight complainants were male (and the remaining 192 female); SD is the standard deviation, and the minimum value of the variable is 0 (female) while the maximum is 1 (male).
Two variables were initially coded as scale variables: defendant race and defendant statement. The former used a three-part classification for race: Caucasian, Aboriginal or Torres Strait Islander (Indigenous) and Other. These were recoded dichotomously using dummy variables by classifying defendants as Caucasian or not (1 or 0), Indigenous or not (1 or 0), and so on. Similarly, the four scale classification for defendant statement was recoded onto “confession or not” (1 or 0), “denied committing offence” or not (1 or 0) and so on. The ages of the complainant and defendant at the time of the offence were initially recorded in years. These were also later collapsed into binary form, with median ages of 17 and 26 as the divide. Hence for complainants, 17 years or fewer were coded as 0, 18 years or more as 1. No breakdown of complainant race is provided, but this did not affect any later analyses.

It was outside the scope of this research to assess the relative effect on guilty pleas or on jurors of the different DNA profiling systems, like the AmpF/STR Profiler Plus Amplification Kit, used from 1997, versus the technology it superseded, such as the British STR Quadruplex. Other studies have examined the effect of DNA match statistics on jurors (see for example, Britton, R., 1998; Koehler, J., 2001a and 2001b; Schklar, J. and Diamond, S., 1999). Cases profiled using alternative systems were differentiated in this study, however, and data recorded for possible future comparative research.
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>No of valid cases</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complainant Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complainant is male (0 = female; 1 = male)</td>
<td>200</td>
<td>0.04</td>
<td>0.20</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Complainant age at time of offence (years)</td>
<td>197</td>
<td>21.88</td>
<td>13.6</td>
<td>4</td>
<td>86</td>
</tr>
<tr>
<td>Comp. race</td>
<td>197</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complainant influenced by alcohol or drugs (0 = not influences; 1 = influenced)</td>
<td>183</td>
<td>0.22</td>
<td>0.42</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Complainant disabled/ intellectually impaired (0 = not impaired; 1 = impaired)</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Offence variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most serious offence charged 0 = Other than rape 1 = Rape</td>
<td>200</td>
<td>0.71</td>
<td>0.45</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Number of charges in court (scale variable)</td>
<td>198</td>
<td>3.36</td>
<td>2.93</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td><strong>Evidence variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprint evidence(1 = present)</td>
<td>196</td>
<td>0.06</td>
<td>0.24</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Photographic evidence (1 = present)</td>
<td>196</td>
<td>0.50</td>
<td>0.60</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Tangible evidence (1 = present)</td>
<td>196</td>
<td>0.19</td>
<td>0.39</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DNA evidence (1 = present)</td>
<td>200</td>
<td>0.51</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Independent witness(es) (1 = present)</td>
<td>198</td>
<td>0.11</td>
<td>0.32</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Defendant variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant age at time of offence (years) Less than 25 years old</td>
<td>200</td>
<td>31.49</td>
<td>10.7</td>
<td>13</td>
<td>64</td>
</tr>
<tr>
<td>26 years old or more</td>
<td>140 (70%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendent employed when arrested (1 = employed)</td>
<td>192</td>
<td>0.47</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant race 0 = Caucasian 1 = Indigenous 2 = other</td>
<td>200</td>
<td>136 (68%)</td>
<td>46 (23%)</td>
<td>18 (9%)</td>
<td></td>
</tr>
<tr>
<td>Defendant is male (1 = male)</td>
<td>200</td>
<td>1.00</td>
<td>0.00</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant statement: 0 = denies committing offence 1 = makes no statement/ refuses interview 2 = makes some admissions 3 = confesses to offence</td>
<td>162</td>
<td>42 (26%)</td>
<td>66 (41%)</td>
<td>23 (14%)</td>
<td>31 (19%)</td>
</tr>
<tr>
<td>Defendant has prior convictions</td>
<td>180</td>
<td>0.23</td>
<td>0.42</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Complainant-defendant relationship 0 = Complainant and defendant strangers 1 = Complainant and defendant acquainted 2 = Complainant and defendant familial</td>
<td>192</td>
<td>29 (15%)</td>
<td>126 (66%)</td>
<td>37 (19%)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Measures of central tendency and dispersion are listed only for interval level measures. Means also are shown for all binary measures to indicate the proportion of cases in those categories coded “1”.
To gauge the effects of DNA evidence on the various decision-making stages in the courts, a multivariate technique, as described by Poulos (1993), was employed that allowed the simultaneous assessment of a large number of theoretically relevant variables. The purpose of this analysis was to develop a model that would allow a comparison of the predicted probabilities of case outcomes for given case scenarios either with DNA evidence or without. For all outcomes examined, excepting the length of custodial penalty, the dependent variables were dichotomous as follows:

1. Whether the case reached court (coded as 1) or did not (coded as 0);
2. Whether the accused pleaded guilty (coded as 1) or did not (coded as 0);
3. Whether the accused was found guilty through jury trial (coded as 1) or was not (coded as 0);
4. Whether a custodial penalty was imposed (coded as 1) or was not (coded as 0).

A series of bivariate analyses was conducted firstly, to explore the relationship between each predictor variable and the dependent variables. These were followed by logistic regression analyses to provide likelihood ratios and predictor equations.

**Results of Statistical Analyses**

Table 4.2 presents the bivariate Pearson correlation coefficients examined to determine the significance of these relationships. For the first outcome, whether or not cases reached court, four variables were significantly correlated. The “p” values, or probability that the result is due to chance, were set at the conventional significance levels of 0.05 and 0.01. The values of the Table 4.2 variables in the first column relate to whether the case reached court or alternatively, if it did not proceed. In the District Court, the latter occurs when prosecutors enter a *nolle prosequi*, and in the Magistrates Court when there is “no evidence to offer” (NETO). These four variables were, in decreasing order of strength, seriousness of the offence, use of alcohol or drugs by the complaining party, the defendant making no statement to the police, and use of DNA evidence. While DNA evidence had a positive correlation with cases reaching court, the other significant variables maintained a negative correlation. That is, for example, if the complaining party had used alcohol or drugs, the case was less likely to reach court, because a NETO or *nolle prosequi* was more likely to be entered.
Table 4.2: Bivariate Pearson Correlation Coefficients between Dependent and Independent Variables – Court Processing of 200 Sexual Offence Cases

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Disposition Reached Court</th>
<th>Guilty Plea</th>
<th>Convicted by Jury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp. Age (binary)</td>
<td>0.000</td>
<td>-0.055</td>
<td>-0.010</td>
</tr>
<tr>
<td>Complainant sex</td>
<td>-0.026</td>
<td>0.018</td>
<td>-0.032</td>
</tr>
<tr>
<td>Comp. used alcohol</td>
<td>-0.172**</td>
<td>-0.185**</td>
<td>-0.337*</td>
</tr>
<tr>
<td>Comp. disabled</td>
<td>-0.095</td>
<td>-0.034</td>
<td>0.049</td>
</tr>
<tr>
<td>Complainant race</td>
<td>0.004</td>
<td>-0.038</td>
<td>0.091</td>
</tr>
<tr>
<td>Fingerprints</td>
<td>0.077</td>
<td>0.014</td>
<td>-0.020</td>
</tr>
<tr>
<td>Photographs</td>
<td>-0.025</td>
<td>-0.065</td>
<td>0.133*</td>
</tr>
<tr>
<td>Tangible evidence</td>
<td>0.115</td>
<td>0.114</td>
<td>0.272*</td>
</tr>
<tr>
<td>DNA evidence</td>
<td><strong>0.135</strong></td>
<td><strong>0.035</strong></td>
<td><strong>0.290</strong></td>
</tr>
<tr>
<td>Defendant age</td>
<td>0.000</td>
<td>-0.055</td>
<td>-0.010</td>
</tr>
<tr>
<td>Deft employment</td>
<td>-0.006</td>
<td>-0.103</td>
<td>-0.137</td>
</tr>
<tr>
<td>Deft. Caucasian race</td>
<td>0.027</td>
<td>0.023</td>
<td>-0.051</td>
</tr>
<tr>
<td>Deft Indigenous race</td>
<td>0.041</td>
<td>0.008</td>
<td>0.200</td>
</tr>
<tr>
<td>Deft other race</td>
<td>-0.105</td>
<td>-0.050</td>
<td>-0.200</td>
</tr>
<tr>
<td>Deft confessed</td>
<td>0.037</td>
<td>0.299**</td>
<td>0.191</td>
</tr>
<tr>
<td>Deft made admissions</td>
<td>0.103</td>
<td>-0.026</td>
<td>0.040</td>
</tr>
<tr>
<td>Deft denies offence</td>
<td>0.095</td>
<td>-0.131</td>
<td>0.146</td>
</tr>
<tr>
<td>Deft no statement</td>
<td>-0.155*</td>
<td>-0.104</td>
<td>-0.278*</td>
</tr>
<tr>
<td>Prior offence record</td>
<td>-0.009</td>
<td>0.023</td>
<td>0.177</td>
</tr>
<tr>
<td>Prior relation to comp</td>
<td>-0.095</td>
<td>-0.003</td>
<td>-0.339*</td>
</tr>
<tr>
<td>Deft-comp strangers</td>
<td>0.073</td>
<td>0.002</td>
<td>0.416**</td>
</tr>
<tr>
<td>Independent witness</td>
<td>-0.022</td>
<td>0.026*</td>
<td>-0.145</td>
</tr>
<tr>
<td>Number of charges</td>
<td>-0.009</td>
<td>0.073</td>
<td>0.049</td>
</tr>
<tr>
<td>Most serious offence</td>
<td>-0.209**</td>
<td>-0.392**</td>
<td>-0.239</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01.
The second outcome, examining whether or not the defendant entered a plea of “Guilty”, produced five independent variables that were significantly correlated. The strongest of these was seriousness of the offence (negative), and a confession to the police by the defendant (positive). Use of alcohol or drugs by the complainant was again a significant factor, making it less likely to produce a guilty plea from defendants. For a third possible result, cases in which the accused faced a jury trial and was convicted, seven independent variables were significantly correlated.

Of the 200 cases sampled, 40 either had no evidence to offer (NETO) in the Magistrates Courts or were finalised through a nolle prosequi in the higher court, resulting in 160 cases reaching court. In ten of the cases, records accessed did not indicate whether finalisation was through a plea or trial. Of the 190 known cases, 87 pleaded guilty, and 103 did not. Juries decided 47 cases, producing a guilty finding in 27 and acquitting in the remaining 20. The overall result was 122 convictions (guilty pleas plus jury decisions) and 78 non-convictions (jury acquittals plus NETO/nolles). Custodial sentences were imposed in 106 of the 122 convictions. The average penalty was five years and nine months, with a minimum penalty of two months and a maximum of life (15 years).

In order to evaluate the effects, if any, of DNA evidence on sentencing decisions, only the 27 cases that were heard in the District Court by the sentencing judge and that resulted in a guilty verdict were analysed. Cases with guilty pleas were excluded, because according to the DPP, in guilty plea cases the prosecution does not present the evidence in court. Since the sentencing judge is not aware of the nature of the evidence against the accused, it cannot form an independent variable. The analysis of whether or not a custodial penalty was imposed was based on these 27 cases, where in each instance the offender was imprisoned. DNA and all other evidence, while obviously contributing to the guilty verdict, showed no influence in causing any variation to whether or not a custodial penalty would be imposed.

To test any effects of DNA evidence on the length of sentence, the same 27 cases were analysed. A bivariate correlation between DNA and length of sentence was conducted for the 27 cases, with this value this calculated at 0.045, which (with sig. 0.411) was not statistically significant. Because DNA had no significant association
with the length of penalty it could not, therefore, act as a predictor of such. No further analysis of the influence of other variables was deemed necessary.

Following the bivariate analyses, multivariate analyses were conducted. The purpose of these was to predict the odds for outcomes at each decision making stage, controlling for all relevant independent variables. For all outcomes logistic regression was used because the dependent variable was dichotomous. To be meaningfully interpreted, the model allows for the calculation of the conditional probability of the outcome for an accused at each stage, given the case characteristics.

Table 4.3 shows the results of the logistic regression analyses. Logistic regression models were created using SPSS version 9.0 for Windows software. Variables found to have a significant relationship in the bivariate analyses were entered to create a full model, and then those that were not predictive were removed. In the reduced model, only the independent variables that were statistically significant below the 0.10 level were retained (Poulos, 1993: 21, 26). By being incorporated simultaneously in the model, the variables controlled for each other’s effects.
Table 4.3: Significant Predictor Variables from Logistic Regression Analysis: Sexual Offence Cases.

<table>
<thead>
<tr>
<th>Court Process</th>
<th>Predictor</th>
<th>Beta</th>
<th>Sig. of Beta</th>
<th>S.E.</th>
<th>Odds Ratio</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Reached court</td>
<td>Deft refuses interview</td>
<td>0.87</td>
<td>.0403</td>
<td>0.43</td>
<td>0.42</td>
<td>0.18</td>
</tr>
<tr>
<td>(N = 200)#</td>
<td>Seriousness of offence</td>
<td>-1.64</td>
<td>.0107</td>
<td>0.64</td>
<td>0.19</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>DNA evidence</td>
<td>0.74</td>
<td>.0902</td>
<td>0.43</td>
<td>2.09</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>Constant (B0)</td>
<td>2.84</td>
<td>.0000</td>
<td>0.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>81% cases correctly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>classified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R²= 15%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X² = 15.7 (sig0.0013)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guilty Plea</td>
<td>Deft confesses</td>
<td>1.63</td>
<td>.0000</td>
<td>0.50</td>
<td>5.09</td>
<td>1.91</td>
</tr>
<tr>
<td>(N = 143)#</td>
<td>Seriousness of offence</td>
<td>-1.84</td>
<td>.0011</td>
<td>0.41</td>
<td>0.16</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Constant (B0)</td>
<td>0.82</td>
<td>.0171</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>73% cases correctly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>classified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R²= 15%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X² = 37.5 (sig 0.0000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jury convicts</td>
<td>Comp intoxicated</td>
<td>-3.40</td>
<td>.0300</td>
<td>1.56</td>
<td>0.03</td>
<td>0.002</td>
</tr>
<tr>
<td>(N = 47)#</td>
<td>Tangible evidence</td>
<td>3.22</td>
<td>.0445</td>
<td>1.60</td>
<td>25.03</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td>DNA evidence</td>
<td>3.50</td>
<td>.0287</td>
<td>1.60</td>
<td>33.14</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>Deft refuses interview</td>
<td>-2.12</td>
<td>.0753</td>
<td>1.19</td>
<td>0.12</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Constant (B0)</td>
<td>0.15</td>
<td>.7995</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>72% cases correctly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>classified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R²= 53%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X² = 18.3 (sig. 0.0011)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Not all data were available for every case. Although juries were known to have decided 47 of the 200 cases, for example, data for the four independent predictor variables were found for only 36 of those cases. Note: The larger confidence intervals for the independent variables “DNA” and “defendant refuses interview” are wide because of the small number of cases on which the regression model is based, and the associated large standard errors.
In Table 4.3 the “Predictor” column displays the independent variables that most strongly influence the court process listed in the left column. The “Beta” column shows the logistic regression coefficient, “S.E.” is the standard error, while the “Odds ratio” is the exponentiate of the Beta value. The “Odds ratio” indicates the likelihood of a particular outcome where a designated variable is present in a case. For example, cases were more likely to reach court when incriminating DNA evidence was presented than when it was not – the odds of reaching court were 2.09 times higher for DNA cases than for non-DNA cases. For variables with a negative regression coefficient (negative Beta value), it can be predicted that where the suspect makes no statement or refuses a police interview, the case has a reduced chance of reaching court compared to where the suspect exercises another interview option – the odds being more than halved (0.42) where the suspect refuses an interview. Similarly, compared to rape cases, the odds of lesser offences reaching court are much reduced – the odds for lesser offences being only about one-fifth (0.19) those for serious offences. The lower and upper 95% confidence intervals are reported for the odds ratio results.

“Cases correctly classified” gives a percentage of how accurately the model will correctly classify cases overall. For example, in 100 cases where we know the seriousness of the offence, whether or not the defendant refused an interview and if DNA evidence were available, the model would correctly predict for 81 cases whether the offender would be prosecuted. The fact that the model does not correctly classify 19% of the cases indicates that the decision to imprison is based on additional pieces of information not included in the logistic regression model. These may include other known independent but non-significant variables, or other facts considered by the prosecutors that did not fit into the variable categories allotted. A pseudo measure of explained variation (Nagelkerke $R^2$) is provided, and for guilty pleas this was 15%. DNA evidence demonstrated no significant effect in sexual offence cases on inducing guilty pleas. This finding was foreshadowed by the low bivariate correlation coefficient of 0.035 between DNA evidence and guilty pleas in Table 4.2. Table 4.3 does, however, reflect the fact that when a confession is made to police it will act strongly as a precursor to a plea of guilty.
Where DNA evidence did assume its greatest strength was in its influence on jury decisions. A jury was much more likely to convict where prosecutors produced DNA evidence than when they did not – the odds of a conviction were more than 33 times higher (33.14) for cases with DNA than for those without. This was followed by tangible evidence (injuries, bruises, forced entry to dwellings and so on), the use of which greatly improved the chances of a jury conviction – the odds ratio being 25.03.

The two other significant variables affecting jury decisions acted, when taken positively, to acquit the accused. The Beta values of -3.4 and -2.12 have odds ratios of 0.03 and 0.12 respectively. Thus, when the complainant was influenced by alcohol or drugs, a jury was much more likely to acquit than when they were not – the odds of an acquittal nearly thirty times higher for cases where victims were intoxicated than where they were not. In cases where a suspect made no statement to police, often on legal advice, and had time to compile a defence, usually based on the consent issue, the odds of the jury convicting were significantly diminished over cases where the suspect consented to a police interview, as the odds ratio stood at 0.12.

**Predicting court outcomes**

Table 4.4 gives examples to illustrate the effects of DNA evidence as a statistical predictor of the conditional probability of cases reaching court and of jury convictions. To calculate the conditional probability for a dichotomous outcome when individual case characteristics are known, the formula used is:

\[
\text{Probability} = \frac{1}{1 + e^{-\text{logit}}}
\]

where the \( \text{logit} = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \ldots + B_kX_k. \)

\( B \) is the Beta value from Table 4.3, with \( B_0 \) the constant. Case examples demonstrating both significant and minor differences forensic DNA can make to case outcomes are shown in Table 4.4.
Table 4.4:  Conditional Probabilities of Court Outcomes for Various Case Characteristics.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Logit $B_0 + B_1 \ldots + B_i$</th>
<th>Probability $1/1 + e^{-\text{logit}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whether case reaches court</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 1 characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant makes no statement to police</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charged with rape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>0.33</td>
<td>0.25</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>1.07</td>
<td>0.74</td>
</tr>
<tr>
<td>Case 2 characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant consents to police interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge other than rape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>2.84</td>
<td>0.95</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>3.58</td>
<td>0.97</td>
</tr>
<tr>
<td><strong>Jury Decision of Guilty</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 3 characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complainant intoxicated at time of incident</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tangible evidence (injuries, bruising, forced entry)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant makes no statement to police</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>-2.15</td>
<td>0.10</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>1.35</td>
<td>0.79</td>
</tr>
<tr>
<td>Case 4 characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complainant not intoxicated at time of incident</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tangible evidence (injuries, bruising, forced entry)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant makes no statement to police</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>1.25</td>
<td>0.78</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>4.75</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Table 4.4 illustrates how DNA evidence had pronounced effects on whether a case reached court and whether a jury found the accused guilty. If the case configurations are known, the calculations of conditional probability offer answers to questions such as “Will the case reach court?”, and “Will a jury convict or exonerate?”. Pairs of cases in Table 4.4 illustrate how, in some circumstances, DNA evidence will alter the court outcome prediction, while in other cases, DNA will make little difference. Case scenarios with conditional predictions for guilty pleas and for the imposition of custodial penalties are omitted, as DNA evidence had no significant effects on these outcomes.
In Case 1, where the defendant was charged with rape and made no statement to police, or refused a police interview, incriminating DNA evidence made the difference between whether the case reached court or not. The inclusion of DNA evidence increased the conditional probability from 0.25 to 0.74. That is, the probability altered from being unlikely to being likely, as the value was enlarged to exceed the 0.5 threshold. In Case 2, however, the addition of DNA evidence to the prosecution case made little difference to whether the case reached court, as the conditional probability value increased only from 0.95 to 0.97. The model correctly classified 81% of cases.

With jury decisions, in Case 3, incriminating DNA evidence, along with physical evidence of bruising, injuries, or forced entry to dwellings, caused the conditional probability of a guilty finding to increase from 0.10 to 0.79 in cases where the complainant was intoxicated at the time of the incident. That is, the addition of DNA evidence changed the predicted verdict from not guilty to guilty. In Case 4, however, with similar characteristics except that the victim was not intoxicated, DNA evidence did not alter the predicted finding of guilt, although it increased the conditional probability from 0.78 to a near certainty of 0.99. The model correctly classified 72% of cases decided by juries.

It is possible that the powerful predictive ability of the statistical method applied above may be useful in prioritising cases for prosecution where laboratory backlogs exist. Cases that have configurations where incriminating DNA evidence is predicted to alter outcomes would be given priority over cases where it is expected to make little difference. Appendix C provides an outline of this concept.

Findings in relation to the hypotheses

Effects on cases reaching court

A trend was discerned confirming the first hypothesis, that a higher proportion of cases reach court where prosecutors present DNA evidence. Forty of the 200 cases sampled (20%) resulted in a *nolle prosequi* by the Office of the Department of Public Prosecution (DPP), or had No Evidence to Offer (NETO) or showed “no true bill” in the Magistrates Courts. The logistic regression analysis of cases reaching court found
DNA evidence to be the only positive predictor, although not a significant one, of cases being finalised in court. The finding that cases with DNA evidence are marginally more successful at surviving the numerous screening levels in the criminal justice process, supports the conclusion by Peterson et al. for forensic evidence generally, that “cases with physical evidence tend to go to trial a greater percentage of the time” (1984: xxiii).

The only significant predictor of cases not reaching court was if the defendant made no statement to police or refused a police interview. It was apparent from police crime reports that suspects nearly always refused police interviews if they had previous dealings with police, or on the advice of legal counsel. The fact that police have not negated any defences put forward by a suspect during an interview may deter the DPP from pursuing cases. The DPP were also more likely to follow through to court with cases involving less serious charges than rape, possibly because of the much higher rate of guilty pleas associated with the lesser offences.

According to the report *Heroines of Fortitude*, the New South Wales DPP may decide to “no bill” a matter in the case of sexual assault proceedings “where the victim is unwilling or unable to cope with the rigours and stress of a trial”. Twenty seven percent of all court cases (including non-sexual offences) “no billed” in NSW in 1994-95 were related to considerations of the victim/witness (Department for Women NSW, 1996: 91-92). It was noted that several cases sampled in this study were similarly withdrawn at the request of the complainant prior to District Court trial. A random sample of 50 rape and 50 unlawful carnal knowledge complaints in Queensland from 1997-98 revealed that 24% of the former and 18% of the latter were withdrawn even before any arrests or charges were made.

In addition to considerations of the victim, the most common reasons for the DPP withdrawing prosecutions are “that there is simply not a sufficient body of admissible, reliable evidence available to establish a case in law and thus to justify a prosecution” (Sallmann and Willis, 1984: 62). This might explain the high proportion of cases not prosecuted where victims used alcohol, indicated by the high correlation coefficient in Table 4.2, as a greater potential may exist for the credibility of complainant testimony to have doubt cast upon it during cross-examination.
Delays in the reporting of the offence cause difficulties in preparation of the case, both with witness testimony and forensic evidence. Legosz found that “only 7.8% of sexual offences were reported to police within the first week of their occurrence” (1999: 15). Delays in reporting were largely due to “the intrusiveness of the offence (penetrative offences) and the relationship of the offender to the victim (relatives)” (Legosz, 1999: vii). An overwhelming proportion of such cases were similarly found by Queensland’s Project Axis to involve delays in reporting the offence: one survey showed that a minimal two percent of offences against children were reported within one week of their commission. Where children are sex abuse victims, difficulties can arise with eliciting their testimony (Queensland Crime Commission and Queensland Police Service, 2000: 5, 48). The Project Axis report noted, “the effect of even minimal delay is often the loss of valuable DNA and other forensic evidence” (Queensland Crime Commission and Queensland Police Service, 2000: 24-26). The majority of non-convictions, 64.5%, on average, for offences of “indecent dealing with a child under 16 years” were due to a nolle prosequi (Legosz, 1999: 31).

In spite of this claim, it appears that a number of factors other than DNA evidence will impinge with greater strength on whether a case eventually reaches court. Such factors shown in Table 4.4 that decrease that likelihood include if the defendant makes no statement to police, and if the offence is other than rape. Other reasons include if the victim is unwilling to face the potential trauma of a trial and withdraws the complaint, while instances where the complainant was intoxicated were strongly co-related with cases not reaching court.

Effects on guilty pleas

Not surprisingly, confessions to police by suspects were found to be the strongest predictor of the accused entering a guilty plea. Just under half (46%) of the cases sampled, 87 of 190 cases where it could be ascertained, culminated in such a plea. A study in Victoria similarly found, “by far the best predictor of plea was the initial record of interview…. Of those accused who pleaded guilty, 82% had made full admissions to the police” (Law Reform Commission of Victoria, 1991: 83). A guilty
plea from defendants was found less likely in this study where the victim had used alcohol or drugs, where the offence was rape, and where the defendant was older.

The proportion of cases with guilty pleas has been found to vary with the type of offence, with about a quarter of rape cases involving pleas of guilty, and other types closer to half. In Queensland, the average percentage of guilty pleas for different offence types from 1994-96 was found to be: rape 28.3%, other sexual offences against adults 54.1% and child sex offences 55.8% (Legosz, 1999: 38). A similar reduced likelihood of a guilty plea where the offence was rape was found in New South Wales (Department for Women NSW, 1996: 70) and Victorian studies. The reasoning attributed to this was that “given the seriousness of the charge, there may have been a greater incentive to ‘go for broke’ and try for an acquittal, rather than plead guilty and accept a substantial (albeit reduced) sentence” (Law Reform Commission of Victoria, 1991: 84). Severity of the potential penalty motivates more defendants to opt for trial, a point often ignored by proponents of harsher penalties. Along with its association with prosecutions not reaching court, complainant use of alcohol correlated in the present study with defendants’ decisions to plead not guilty, perhaps because they believed (correctly, according to the findings on jury decisions below), that their chances of an acquittal were improved.

DNA evidence, contrary to a tenet common among forensic scientists, exhibited no significant effect on inducing guilty pleas based on comparing the sexual offence cases sampled. This outcome is tabulated in the low correlation between “DNA evidence” and “Guilty Plea” in Table 4.2. Taupin’s analysis of the effects of DNA evidence on guilty pleas in Victorian sexual offence cases reached a similar conclusion (1994: iv). Because of the different guilty plea profiles of rape from other offences, the two categories were separated and tested independently for any significant correlation of DNA group cases to guilty pleas, but none was found. The correlation coefficient between DNA evidence and guilty pleas for non-rape offences was -0.057.
The explanation for this may lie in the timing of the availability of DNA testing results. It was found that test results, in 101 available DNA cases of the 102 sampled, were provided to police on average several months after suspects had been interviewed and arrested (time in days: mean 182; median 133; mode 66; min. 35; max. 621). The apprehension and charging of a majority of suspects for the same 101 DNA cases was accomplished in far shorter times, many being charged within 24 hours (mean 55; median 11, mode 0, min. 0, max. 634 days). While the data sources used in this research were able to reveal which cases were finalised with a guilty plea, the points in time at which these guilty pleas were entered were not available.

Experience in Victoria shows that at the committal hearing one quarter of defendants in rape cases were ready to plead guilty; between the committal and the trial 30% indicated an intention to do so; one third did so at the commencement of the trial, and the remaining 12% entered a plea only after the trial was in progress (Law Reform Commission of Victoria, 1991: 83). A spread of the timing of the pleas would also be expected in Queensland cases.

Both this study and that in Victoria pointed to a confession to police at the initial interview as a predictor of guilty pleas. By confronting suspects with incriminating DNA evidence, if available at that time, more confessions might result, followed by a higher rate of guilty pleas. The second hypothesis, that more guilty pleas result where prosecutors present DNA evidence, was therefore discounted, as the quantitative evidence did not support it. The implications of this are that expected cost savings through more guilty pleas are not occurring, and will not be realised in sexual offence cases where DNA testing results are provided post hoc to investigators. More cost increases than savings, therefore, are associated with DNA use through sampling costs, laboratory costs, and court delays caused by laboratory backlogs (see Chapter 9).
Effects on jury decisions

In jury trials, incriminating DNA evidence emerged as a crucial predictor of a guilty finding, thereby verifying the third hypothesis. Of 47 cases decided by juries, 20 included DNA evidence while 27 did not. Of the former, 14 resulted in guilty verdicts and six accused were found not guilty. Thirteen cases without DNA evidence resulted in guilty findings with the remaining fourteen having not guilty outcomes. While the logistic regression model correctly classified 72% of cases, factors that were not quantified caused the remaining 28% to fall outside the model developed. Such variables include the use of a weapon, delays in making the complaint, effectiveness of the cross-examination of the complainant, lack of corroboration and types of warnings, if any, given to the jury by the trial judge (Department for Women NSW, 1996; Law Reform Commission of Victoria, 1991). Even the manner in which DNA statistical evidence is presented can make a difference to juror decisions (Schklar and Diamond, 1999; 159-184; Koehler, 2001: 493-513).

As a factor affecting jury findings, DNA evidence was followed in significance by whether the victim was under the influence of alcohol or drugs, a variable that influenced juries to acquit (refer Table 4.4). Alcohol consumption by victims or accused at the time of the alleged offence was found not uncommon in the sexual assault cases sampled. However, victims were influenced by drugs in only three cases sampled, in one case in combination with alcohol. The Rape Law Reform Evaluation Project also found in Victoria that “19.6% of complainants had consumed some alcohol…while 10.3% said that they were drunk at the time of the assault [while] 8.2% appeared to be under the influence of other drugs” (Heenan and McKelvie, 1997: 39). Any inference that the complainant may have contributed to the offence has been criticised as representing “an antiquated view of women and their participation in the world by saying that women who engage in particular behaviour, such as being out at night and drinking, put themselves at risk and make themselves vulnerable to sexual assault or, worse, freely available for sex” (van de Zandt, 1998: 134).
Tangible evidence of the offence – medical reports, obvious victim injuries, bruises, forced entry to dwellings and so on – were difficult for defendants to explain away, and, according to the logistic regression analysis, were a strong predictor in swaying juries towards a conviction. Cases where defendants made no statement to police or refused a police interview predicted, though not significantly, a finding of not guilty. They could later use consent, or belief of consent, as a defence. Also by refusing police interviews, defendants gained time to seek legal assistance, if they had none already, and thereby could prepare a more effective defence.

Examining DNA evidence cases where acquittals resulted is informative. In five of the six cases, all rapes, with DNA evidence where acquittals occurred, the victim was intoxicated and knew the accused, while for the sixth case information on this aspect was not found. In four of the six cases with DNA evidence and a not guilty finding, suspects made no statement to police or refused to be interviewed; in one case some admissions as to being with the complainant were made, while information was not available on the remaining case. Additional elements in one rape case were two co-accused against whom DNA evidence was not presented. This may have allowed a preponderance of witness evidence against the complainant who had been intoxicated at the time of the alleged offence.

The impact of DNA evidence in child sexual assault trials has been the subject of research using hypothetical scenarios. The study tested mock jurors’ reactions to DNA evidence in comparison to child victims’ and witnesses’ testimony, confirming the potency of DNA evidence in the opinions of the participants (Golding, Stewart, Yozwiak and Sanchez, 2000: 373-383).

*Effects on sentencing*

Sentences in Queensland are imposed in the District Courts under the *Penalties and Sentencing Act 1992*, and judicial discretion is limited both as to the imposition of custodial sentences and to a lesser extent, on the length of sentences. The Act may be used in conjunction with the *Queensland Sentencing Manual* (Robertson and
Mackenzie, 1998). Sentencing guidelines are contained in section 9 of the Act. These state that imprisonment should be imposed as a last resort, and that in sentencing an offender, the court should consider a number of matters, including any prescribed range of penalties, seriousness of the offence, harm suffered by the victim; damage, injury or loss caused; the offender’s age, character and intellectual capacity; any aggravating circumstances and prevalence of the offence. The Act does not specify the relevance of any evidence presented at trial, so that no direct nexus between DNA evidence and sentencing decisions necessarily exists.

Maximum sentences are prescribed by Queensland’s **Criminal Code Act 1899**: rape offences can incur a penalty of life imprisonment under s.349, while attempted rape and assault to commit rape can attract fourteen years maximum sentences under sections 350 and 351. Of those found guilty of sexual offences in Queensland between 1994 and 1997, DPP data show that 75% were imprisoned or received a suspended prison sentence (Legosz, 1999: 40). For rape offences, 23% of sentences imposed in 1997-98 were for ten years and over or for life, and 73% ranged in length between two and ten years, while the remaining four percent were non-custodial (Government Statistician’s Office, 1999: 14).

When tested, DNA evidence did not emerge as a significant variable at the point of sentencing as postulated in the fourth and fifth hypotheses. This contrasts with the findings of American studies in the 1980s on forensic evidence. Peterson et al. explained why, in their opinion, the imposition of more custodial penalties in the U.S. was associated with forensic evidence: “The certainty that the defendant committed the offence, which forensic science evidence sometimes provides, may induce the judge to incarcerate the defendant rather than grant probation or, where incarceration is mandated, to increase the length of incarceration” (1987: 1743). This argument does not appear to apply in Queensland and is highly unlikely in any jurisdiction (such as Australia) where juries play no part in sentencing and where plea-bargaining is unknown and/or illegal.

Other studies have found sentencing for sexual offences to be subject to a variety of influences. Kate Warner examined how appellate decisions treated the issues below,
providing arguments made from the bench in specific cases. She then analysed how these factors acted to vary the length of sentences:

* the fact that the victim was intimately known to the offender
* the prior sexual history of the victim
* imprudent or provocative behaviour by the victim
* the unconscious or intoxicated state of the victim

Neither the factors considered for deciding sentences in the Penalties and Sentencing Act, nor those examined by Warner, could be measured statistically for their effects in the present study.

CONCLUSION

Findings in this chapter were that DNA evidence acted as a useful predictor of whether a decision would be made to prosecute, and it played a crucial role in jury findings of guilt. However, the most important form of evidence for explaining convictions in sexual offence cases was a confession by the suspect to police. In cases of rape, if a suspect made no statement to police, or refused an interview, the case was less likely to reach court. Evidence of victim injuries, bruising, forced entry to dwellings and torn clothing (“tangible evidence”) influenced juries towards a guilty verdict, but complainant use of alcohol or drugs was shown to weaken the case against the defendant throughout the different stages in the prosecution process. In cases where judges pronouncing sentences were aware of it, there was no discernible effect of DNA evidence, either on the imposition of a custodial penalty, or on the length of sentence. DNA evidence did not act as a precursor of guilty pleas in sexual offence cases to reduce court costs, but sampling and laboratory costs caused overall cost increases. Arguably, any such increased costs to the community for DNA technology is the price that must be paid for the greater certainty and improved technical accuracy that DNA profiling brings to the justice process.
CHAPTER 5: EFFECTS ON HOMICIDE CASES IN COURT

INTRODUCTION

This chapter extends the scope of the research to assessing the effects and strength of DNA evidence in homicide cases as they progressed through the criminal courts. It also relates numbers of homicides reported to police in Queensland to numbers of cases where a probative DNA statement was produced by the forensic laboratory. The effects of DNA were assessed from analysis of primary data within a context of other evidentiary and extra-legal factors that may have had a bearing on case outcomes. A sample of 150 solved and completed cases referred by police for prosecution in the jurisdiction of Queensland was selected for examination. In half of these cases DNA evidence was available to prosecutors to relate the accused to the crime, while the other half acted as a control group and did not include DNA evidence. Examined were the effects, if any, of forensic DNA on decisions by prosecutors about whether to proceed to court or to *nolle*, the effects on guilty pleas by defendants, and effects on jury decisions. The chapter then assesses any effects of forensic DNA on the sentencing stage through examining any associations with variations in custodial penalty length.

Hypotheses to test

The two highly publicised cases outlined in Chapter 1 are examples of the probative value that DNA evidence may have in court, and its potential in possibly influencing pre- and post-court outcomes. However, there is an absence of comparative Australian studies that have examined the effects of DNA on homicide court cases, so it is uncertain from anecdotal evidence alone whether the absence or presence of DNA has any bearing on the outcome of homicide cases in the criminal justice process overall. As was noted in the literature review, Peterson et al. found that in two of the four jurisdictions they studied in the US, conviction rates were significantly higher where physical evidence linked the defendant with the crime (1984: xvii).

This chapter tests hypotheses similar to those listed previously:
• That a higher proportion of homicide cases would reach court where DNA evidence was presented by prosecutors;
• That more guilty pleas would result where suspects were confronted with DNA evidence associating them with victims, with exhibits such as weapons, or with crime scenes;
• That a significant relationship would be found between DNA evidence implicating the accused and the likelihood of a conviction by juries;
• That longer custodial penalties would be imposed in manslaughter cases where incriminating DNA evidence was presented.

The hypothesis relating to the sentencing phase was retained due to the positive relationship between forensic evidence and sentencing found in the United States by Peterson et al. (1987: 1730). The final hypothesis was modified for this chapter in relation to the length of custodial penalties imposed. These could only be tested in relation to manslaughter cases, because mandatory life sentences are imposed in Queensland for murder offences. Such mandatory sentences constitute a constant rather than a variable.

**Method**

The research method adopted largely replicates that used in the previous chapter, particularly in the analysis and reporting of statistical results, and this inevitably leads to some repetition. This uniform approach for different offence types was purposely taken in order to facilitate a cross-comparison of results for the evaluation conducted in Chapter 9. A sample of 150 homicide cases was used in order to analyse the effects of DNA evidence on such offences in the court process. Selection was again subject to the ethical permissions and conditions governing this research. Seventy-five homicide cases that utilised DNA evidence were chosen from Queensland Health’s forensic biology laboratory files. These cases were the maximum number available at the time of selection where a directly incriminating link was made through DNA testing between the suspect and either the victim, the crime scene, or a weapon proven to be used by the accused in the offence. The 75 cases covered offences that occurred between 14 January 1996 and 3 December 1999. The last date
was the most recent case for which results through to the Court of Appeal were available when data were collected from the forensic laboratory in 2001. Proceeding back in time, every available DNA case file was scrutinised and included if it met the further selection criteria:

- that the cases be completed so that they could be tracked to finality in the justice process, that is, past the appeal stage in the courts;
- that a forensic laboratory scientist had produced a sworn court statement in which the defendant was associated through DNA profiling with either the victim or the crime scene;
- that no defendants were subject to penalties for juveniles (which can be different from those for adults);
- that police and court records could be located;
- that no cases referred to the Mental Health Tribunal were included, as these were not adjudicated by the criminal courts.

A control group of 75 other homicide cases was then chosen from the computerised records of the Queensland Police Service (QPS). They were taken from within the same time bracket and jurisdiction in order to place them in a contemporaneous social and legal context and to meet the same selection criteria except for the second. This control group was not a random sample but was selected to mirror the DNA group as far as possible, in order to minimise biases when conducting comparisons. Data on court outcomes were accessed through the QPS Police Information Centre during 2002. The sample population of 150 cases was of sufficient size in relation to the number of independent variables to allow significant relationships to be calculated statistically (Tabachnick and Fidell, 2001: 521-2). Due to imperfections in the records consulted, not all of the variables were available for every case sampled.

A binary division of offence seriousness was used throughout, where “one” was the higher in the two-level hierarchy of offences (murder) and “zero” was allocated to the lesser offence (manslaughter). This dichotomy was suitable for direct insertion into the later logistic regression analyses. A measure of parity between both groups in the sample was for the seriousness of the offence. This was done to ensure that incidents
referred for DNA analysis were not significantly more serious that those selected for the control group. A higher percentage of DNA cases (65%) retained the murder charge upon committal in comparison to the control group (58%), but this did not rate as statistically significant in a bivariate analysis.

A listing of descriptors of the independent or predictor variables for the cases sampled is set out in Table 5.1, along with their means and standard deviations where meaningful. The independent variables are divided into four general categories: victim variables, offence variables, evidence variables and defendant variables. Social data, such as age, race and sex of victims and accused were obtained from QPS records and included, as these may have had a bearing on case outcomes (White and Perrone, 1997: 91-101). Relationships between defendants and victims were included as independent variables. A strong body of criminological research has demonstrated the relevance of these relationships (Polk, 1994; Mouzas, 2000). Very few homicides in the sample were found to have occurred between strangers, leaving the relationship in the remaining 120 cases where it could be found to be dichotomously classified as “known” to one another, or “enmeshed”. The latter is a broad term used to include married or defacto partners, ex-partners and parents-children. Examples in the sample were a female who killed her sister’s partner while intervening in a domestic dispute, and another who killed her mother’s defacto.

Categories omitted as independent variables, but which were used in the previous chapter, were photographic evidence and “tangible” evidence, the latter including a deceased victim. This was because both of these factors were found present in all but one or two cases and constituted a lack of variability. Apart from where indicated on Table 5.1, most predictor variables were binary, with the value of one reflecting inclusion in the category. As not all data were available for every case from the records accessed, one column indicates the number of cases for each variable where data could be found. The first variable is described as measuring whether the victim was male. This variable was ascertained in 149 cases; the mean of 0.65 indicates that 65% of the 149 victims (that is, 97) were male. Thirty-five percent (52) were female, and the remaining one unknown. SD is the standard deviation, and the minimum value of the variable is 0 (female) while the maximum is 1 (male).
Two variables were initially coded as scale variables: defendant race and defendant statement. The former used a three-part classification for race: Caucasian, Indigenous and Other. These were recoded dichotomously using dummy variables by classifying defendants as Caucasian or not (1 or 0), Indigenous or not (1 or 0), and so on. Similarly, the four scale classification for defendant statement was recoded into “confessed or not” (1 or 0), “denied committing offence” or not (1 or 0) and so on. The ages of the victim and defendant at the time of the offence were initially recorded in years. These were also later collapsed into binary form, with median ages of 35 years for victims and 30 for defendants as the divide. Hence ages for victims 35 years of age or less at the time of the offence were coded as 0, and those aged 36 years or more as 1. The study did not assess the relative effects of the different types of DNA profiling technology used over the period from which cases were selected. No breakdown of victim race is provided, but this did not affect any later analyses.

**Effects of DNA evidence on the court process: data analysis**

To gauge the effects of DNA evidence on the various decision-making stages in the courts a multivariate technique was employed. Dichotomous dependent variables were defined as:

- Whether the case reached court (coded as 1) or did not (coded as 0);
- Whether the accused pleaded guilty (coded as 1) or did not (coded as 0);
- Whether the accused was found guilty through jury trial (coded as 1) or was not (coded as 0).

All guilty findings in homicide cases resulted in custodial penalties, so no binary coding was used for whether or not the offender was imprisoned. The only outcome in the form of a scale variable was the length of custodial penalty in manslaughter cases, as those found guilty of murder were subject to the mandatory life penalty. Prior to 1 July 1997, those serving the life penalty were not eligible for parole for thirteen years, and after that date, fifteen years, while the penalty for committing two murders was twenty years.
Table 5.1: Independent Variables Examined: 150 Homicide Cases

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>No of valid Cases</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victim variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victim is male (0 = female; 1 = male)</td>
<td>149</td>
<td>0.65</td>
<td>0.48</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Victim age at time of offence (years)</td>
<td>138</td>
<td>36</td>
<td>17.5</td>
<td>1</td>
<td>85</td>
</tr>
<tr>
<td>Victim race</td>
<td>134</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offence Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most serious offence charged</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Manslaughter</td>
<td>148</td>
<td>0.61</td>
<td>0.49</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1 = Murder</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Murder</td>
<td>91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprints (1 = present)</td>
<td>140</td>
<td>0.26</td>
<td>0.44</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DNA court statement (1 = present)</td>
<td>150</td>
<td>0.49</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Independent witness(es) to offence (1 = present)</td>
<td>140</td>
<td>0.27</td>
<td>0.45</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant age at time of offence (years)</td>
<td>145</td>
<td>31</td>
<td>10.3</td>
<td>14</td>
<td>59</td>
</tr>
<tr>
<td>Defendant employed at time of arrest (1 = employed)</td>
<td>143</td>
<td>0.27</td>
<td>0.45</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = Caucasian</td>
<td>147</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Indigenous</td>
<td>88 (60%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = other</td>
<td>41 (28%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 (12%)</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant is male (0 = female; 1 = male)</td>
<td>148</td>
<td>0.82</td>
<td>0.38</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant statement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = denies committing offence</td>
<td>121</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = makes no statement/ refuses interview</td>
<td>11 (9%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = makes some admissions</td>
<td>36 (30%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 (13%)</td>
<td>58 (48%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = makes some admissions</td>
<td>36 (30%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 (13%)</td>
<td>58 (48%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = confesses to offence</td>
<td>132</td>
<td>0.48</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant has prior convictions for violence (1 = has priors)</td>
<td>120</td>
<td>2.00</td>
<td>1.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant-victim relationship</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant male known to victim</td>
<td>56 (47%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant male enmeshed with victim</td>
<td>41 (34%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant female known to victim</td>
<td>6 (5%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant female enmeshed with victim</td>
<td>17 (14%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Measures of central tendency and dispersion are listed only for interval level measures. Means also are shown for all binary measures to indicate the proportion of cases in those categories coded “1”.

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For information on the general circumstances, characteristics and trends for homicides in Australia, the National Homicide Monitoring Program that has been instituted in Australia over the last decade should be consulted (Mouzos, 2002a; 2002b).

Next, a series of bivariate analyses was conducted to explore the relationship between each predictor variable and the dependent variables. These were then followed by logistic regression analyses to provide likelihood ratios and predictor equations. Table 5.2 presents the bivariate Pearson correlation coefficients examined to determine the significance of these relationships.
Table 5.2: Bivariate Pearson Correlation Coefficients between Dependent and Independent Variables – Court Processing of Homicide Cases

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Disposition</th>
<th>Court Outcome</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reached court (N = 150)</td>
<td>Guilty Plea (N = 142)</td>
<td>Convicted by Jury (N = 92)</td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victim age</td>
<td>-0.076</td>
<td>-0.234**</td>
<td>0.115</td>
</tr>
<tr>
<td>Victim sex</td>
<td>-0.045</td>
<td>-0.107</td>
<td>-0.233*</td>
</tr>
<tr>
<td>Victim race</td>
<td>0.002</td>
<td>0.181*</td>
<td>-0.183*</td>
</tr>
<tr>
<td>Fingerprint evidence</td>
<td>-0.041</td>
<td>0.088</td>
<td>0.196*</td>
</tr>
<tr>
<td><strong>DNA evidence</strong></td>
<td><strong>0.230</strong></td>
<td><strong>0.100</strong></td>
<td><strong>0.405</strong></td>
</tr>
<tr>
<td>Defendant age</td>
<td>0.020</td>
<td>0.062</td>
<td>0.090</td>
</tr>
<tr>
<td>Defendant sex</td>
<td>0.140*</td>
<td>-0.031</td>
<td>0.138</td>
</tr>
<tr>
<td>Deft. male known to victim</td>
<td>0.076</td>
<td>-0.062</td>
<td>0.000</td>
</tr>
<tr>
<td>Deft. male enmeshed with victim</td>
<td>-0.062</td>
<td>0.062</td>
<td>0.165</td>
</tr>
<tr>
<td>Deft. female known to victim</td>
<td>-0.080</td>
<td>0.018</td>
<td>0.124</td>
</tr>
<tr>
<td>Deft. female enmeshed with victim</td>
<td>0.025</td>
<td>-0.005</td>
<td>-0.267*</td>
</tr>
<tr>
<td>Defendant employment</td>
<td>0.059</td>
<td>-0.055</td>
<td>0.051</td>
</tr>
<tr>
<td>Defendant Caucasian race</td>
<td>0.003</td>
<td>-0.166*</td>
<td>0.240*</td>
</tr>
<tr>
<td>Defendant Indigenous race</td>
<td>-0.017</td>
<td>0.174*</td>
<td>-0.229*</td>
</tr>
<tr>
<td>Defendant other race</td>
<td>0.019</td>
<td>0.010</td>
<td>-0.053</td>
</tr>
<tr>
<td>Defendant confessed</td>
<td>0.151*</td>
<td>0.183*</td>
<td>0.248*</td>
</tr>
<tr>
<td>Defendant made admissions</td>
<td>0.018</td>
<td>-0.001</td>
<td>0.028</td>
</tr>
<tr>
<td>Defendant denies offence</td>
<td>-0.003</td>
<td>-0.030</td>
<td>-0.244*</td>
</tr>
<tr>
<td>Defendant makes no statement</td>
<td>-0.180*</td>
<td>-0.186*</td>
<td>-0.125</td>
</tr>
<tr>
<td>Prior record violence</td>
<td>0.014</td>
<td>-0.103</td>
<td>-0.023</td>
</tr>
<tr>
<td>Independent witness</td>
<td>0.057</td>
<td>0.061</td>
<td>-0.085</td>
</tr>
<tr>
<td>Most serious offence</td>
<td>-0.118</td>
<td>-0.369**</td>
<td>-0.007</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01.
Results of statistical analyses

In the Magistrates Court, cases were not proceeded with through either “no evidence to offer” (NETO) or a “no true bill”. In the District Court they did not reach court because of a nolle prosequi being entered. For the outcome in the first column – whether or not cases reached court – four independent variables were significantly correlated. These were, in decreasing order of strength, DNA evidence, the defendant making no statement to police or refusing an interview, the defendant confessing, and the defendant’s sex. While three of these variables were significantly positively correlated with cases being prosecuted, the defendant’s refusing an interview showed a negative correlation.

The outcome examined in the second column – whether or not the defendant entered a plea of guilty – produced seven independent variables that were significantly correlated, but these did not include DNA evidence. Two of these were positive: a confession to the police by the defendant, and if defendants or victims identified as Indigenous. Negative correlations with guilty pleas were victim age, that is, cases concerning murders of older victims were less likely to produce guilty pleas, defendants being of Caucasian race, cases where defendants made no statement to police, and cases where the charge was murder. Defendants were less likely to plead guilty to murder, presumably because of the life sentence they would face. However, the correlation also reflects the outcomes of plea-bargaining, where the DPP entered a nolle prosequi for murder charges, then followed by a manslaughter charge and guilty plea.

For the outcome in the third column – cases in which the accused faced a jury trial and was convicted – nine independent variables were significantly correlated. DNA evidence was the most significant positive among these, and the only variable with p < .01. Other significant evidentiary variables were the fingerprints of the accused that had probative value, and a confession or a denial by the accused when interviewed. The remaining correlations were social factors: victim sex and race, and the race of the accused. These were negative in value – meaning that, in the case of victim sex and race, juries were more likely to convict where the victim was female or
Caucasian. Similarly, Caucasians were significantly more likely than Indigenous persons to be found guilty by a jury, although as shown in the second column, Indigenous accused were significantly more likely than Caucasians to plead guilty.

Of the 150 cases sampled, 11 had no evidence to offer (NETO) in the Magistrates Courts or were finalised through a *nolle prosequi* in the higher court, resulting in 139 cases reaching court. In eight of the 150 cases, records accessed did not indicate whether finalisation was through a plea or trial. Of the 142 known cases, 47 pleaded guilty, and of the remaining 95, for three a *nolle prosequi* was entered, leaving 92 to be decided by juries. In 33 of these cases juries acquitted, with convictions made in the remaining 59.

The overall result was 112 convictions (guilty pleas plus jury decisions) and 38 non-convictions (jury acquittals plus NETO/*nolles*). Murder convictions numbered 65 and there were 47 manslaughter convictions. For all 112 convictions the offender was incarcerated. Any associations between the independent variables and sentencing for murder convictions were not analysed because the independent variables could not influence the outcome of the mandatory life sentence. The 47 manslaughter convictions all resulted in custodial penalties, so no analysis was conducted to assess the effects of the independent variables on imprisonment. Guilty pleas accounted for 32 of these cases. Where guilty pleas are entered, judges in the superior courts do not hear days of trial evidence, but they must sentence on agreed facts as presented by the prosecutor, and, in most jurisdictions, by a victim impact statement. It is quite possible, therefore, that a sentencing judge would not be aware of the existence of any DNA evidence.

The 15 manslaughter cases that were tried in court and resulted in a conviction were examined to evaluate any effects DNA might have on the length of custodial penalties. The presence of DNA and the length of penalty were known in all fifteen cases, which allowed a bivariate correlation to be conducted. The value of the correlation was -0.192, which was not (at sig. 0.246) statistically significant. On the basis of this analysis, DNA did not have any significant association with the length of penalty. Ten of the 15 cases were from the DNA evidence group, and five were from the non-DNA control group. No table was constructed to illustrate relationships
between the independent variables and the length of penalty because the small size of
the sample and its uneven distribution between the DNA and control groups, which
prevented meaningful values for bivariate correlations. The small sample size caused
anomalies for other correlations; as examples, only three of the cases had fingerprint
evidence, while victims in all 15 cases were Caucasian, so no correlation between
victim race and sentencing could be made.

Following the bivariate analysis in Table 5.2, multivariate analyses were conducted.
Table 5.3 shows the results of the logistic regression analyses. Logistic regression
models were created using SPSS version 9.0 for Windows software. Variables found
to have a significant relationship in the bivariate analyses were entered to create a full
model, and then those that were not predictive were removed. In the reduced model,
only the independent variables that were statistically significant below the 0.10 level
were retained (Poulos, 1993: 26). By being incorporated simultaneously in the
model, the variables controlled for each other’s effects.
### Table 5.3: Significant Predictor Variables from Logistic Regression Analysis: Homicide Cases

<table>
<thead>
<tr>
<th>Court Process</th>
<th>Predictor</th>
<th>Beta</th>
<th>Sig of Beta</th>
<th>S.E.</th>
<th>Odds ratio</th>
<th>95% C.I.</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reached court</strong> (N = 148)#</td>
<td>Defendant sex</td>
<td>1.53</td>
<td>.0364</td>
<td>0.73</td>
<td>4.61</td>
<td></td>
<td>1.10</td>
<td>19.30</td>
</tr>
<tr>
<td></td>
<td>DNA</td>
<td>2.69</td>
<td>.0135</td>
<td>1.09</td>
<td>14.69</td>
<td></td>
<td>1.74</td>
<td>123.99</td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>0.65</td>
<td>.1703</td>
<td>0.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>93% cases correctly classified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R² = 20.7%</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Χ² = 13.14(sig. .0014)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Guilty Plea</strong> (N = 103)#</td>
<td>Victim age</td>
<td>-1.38</td>
<td>.0041</td>
<td>0.48</td>
<td>0.25</td>
<td>0.10</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Def’t makes no statement</td>
<td>-1.26</td>
<td>.0250</td>
<td>0.56</td>
<td>0.29</td>
<td>0.10</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seriousness of offence</td>
<td>-1.44</td>
<td>.0030</td>
<td>0.48</td>
<td>0.24</td>
<td>0.09</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Def’t Indigenous race</td>
<td>0.91</td>
<td>.0684</td>
<td>0.50</td>
<td>2.48</td>
<td>0.93</td>
<td>6.60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>0.94</td>
<td>.0574</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>75% cases correctly classified</td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R² = 29.6%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Χ² = 25.00(sig. .0000)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Jury convicts</strong> (N = 63)#</td>
<td>Victim sex</td>
<td>-1.68</td>
<td>.0509</td>
<td>0.86</td>
<td>0.19</td>
<td>0.03</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fingerprints</td>
<td>3.96</td>
<td>.0175</td>
<td>1.67</td>
<td>52.62</td>
<td>2.00</td>
<td>1385.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DNA evidence</td>
<td>3.14</td>
<td>.0025</td>
<td>1.04</td>
<td>23.09</td>
<td>3.01</td>
<td>176.87</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Defendant confesses</td>
<td>1.93</td>
<td>.0248</td>
<td>0.86</td>
<td>6.01</td>
<td>1.28</td>
<td>37.40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Defendant denies</td>
<td>-2.91</td>
<td>.0328</td>
<td>1.36</td>
<td>0.05</td>
<td>0.00</td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>0.05</td>
<td>.9551</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>81% cases correctly classified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R² = 54.7%</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Χ² = 31.84(sig. .0000)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

# Not all data were available for every case. Although juries were known to have decided 92 of the 150 cases, for example, data for the five independent predictor variables were found for only 63 of those cases. Note: For “jury convicts” the larger confidence intervals for the independent variables DNA and fingerprints are wide because of the small number of cases on which the regression model is based, and the associated large standard errors.
In Table 5.3, the “Predictor” column displays the independent variables that most strongly influence the court process listed in the left column. The “Beta” column shows the logistic regression coefficient, “S.E.” is the standard error, while the “Odds ratio” is the exponentiate of the Beta value. The “Odds ratio” indicates the likelihood of a particular outcome where a designated variable is present in a case. For example, cases involving male suspects were more likely to reach court than those involving female suspects – the odds of reaching court were 4.61 times higher for males than for females. Cases where incriminating DNA evidence was available were also more likely to reach court: the odds being more than fourteen times (14.69) times higher for DNA cases than for non-DNA ones. The lower and upper 95% confidence intervals are reported for the odds ratio results.

“Predicted probabilities” provides a percentage of how accurately the model will correctly classify cases overall. For example, in 100 cases where both the presence or otherwise of DNA evidence and defendant sex is known, the model would correctly predict for 93 cases whether cases would reach court. The fact that the model does not correctly classify seven percent of the cases indicates that the court outcome is based on additional pieces of information not included in the logistic regression model. These may include other known independent but non-significant variables, or other facts relevant to the case that did not fit into the statistical categories where data were collected. A pseudo measure of explained variation (Nagelkerke $R^2$) is provided. For cases that reached court this value was 20.7%.

DNA evidence in homicide cases acted as a statistically significant predictor for cases reaching court, along with the sex of the defendant – males being more likely to go to trial. The point at which DNA evidence assumed its greatest strength in homicide cases was in its influence on jury decisions, where it emerged as a powerful predictor of jury findings. A jury was far more likely to convict where prosecutors produced DNA evidence than when they did not – the odds of a conviction were more than twenty-three (23.09) times higher for cases with DNA than for those without. The other powerful predictor of jury decisions was probative fingerprint evidence, where the odds ratio was greater than 50 (52.62). Juries most likely gave greater credence to physical evidence over the testimonial evidence of the accused. If the defendant had
confessed to police in a record of interview, a conviction was more likely – the odds of a conviction were close to six (6.01) times higher in cases with confessions than for cases without. However, where defendants denied guilt to police, convictions were far less likely – the odds for a conviction were twenty times less than in cases without such denials.

One social variable that acted as a predictor of a guilty finding was if the victim were male. This reduced the chances of a conviction significantly, probably due, as discussed below, to the number of domestic killings where the female accused was exonerated of killing her partner. As found with both sexual offences in the previous chapter and with serious assaults in the chapter that follows, DNA evidence demonstrated no significant effect in homicide cases on inducing guilty pleas or as a predictor of such pleas, as it showed only a low positive statistical correlation of 0.01 with pleas of guilty in homicide cases (Table 5.2). Neither did it show any significant relationship with guilty pleas in manslaughter cases, although this is not shown in the Tables. When tested using 54 manslaughter cases, DNA and guilty pleas showed a correlation of only 0.117 with a significance of 0.199.

**Predicting court outcomes**

Table 5.4 gives examples to illustrate the effects of DNA evidence as a statistical predictor of the conditional probability of cases reaching court and of jury convictions. These were the two stages in the court process where DNA demonstrated a statistically significant predictive effect. To calculate the conditional probability for a dichotomous outcome when individual case characteristics are known, the formula used is:

\[
\text{Probability} = \frac{1}{1 + e^{-\text{logit}}}
\]

where the logit = \(B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \ldots + B_kX_k\).

\(B\) is the Beta value from Table 5.3, with \(B_0\) the constant. Table 5.4 shows case examples demonstrating both significant and minor differences that DNA evidence can potentially make to jury decisions.
Table 5.4: Conditional probabilities of court outcomes for various homicide case configurations at different stages without and with DNA evidence.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Logit ( B_0 + B_1 \ldots + B_i )</th>
<th>Probability ( \frac{1}{1 + e^{-\text{logit}}} )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whether case reaches court</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Case 1 characteristics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>0.65</td>
<td>0.66</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>3.32</td>
<td>0.97</td>
</tr>
<tr>
<td><strong>Case 2 characteristics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>2.26</td>
<td>0.91</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>4.07</td>
<td>0.98</td>
</tr>
<tr>
<td><strong>Jury Decision of Guilty</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Case 3 characteristics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victim is male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No fingerprint evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant refuses police interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>-1.73</td>
<td>0.15</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>1.41</td>
<td>0.80</td>
</tr>
<tr>
<td><strong>Case 4 characteristics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victim is female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No fingerprint evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant refuses police interview</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>-0.05</td>
<td>0.49</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>3.69</td>
<td>0.98</td>
</tr>
<tr>
<td><strong>Case 5 characteristics:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victim is male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No fingerprint evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant confesses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA evidence</td>
<td>0.20</td>
<td>0.55</td>
</tr>
<tr>
<td>With incriminating DNA evidence</td>
<td>3.34</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Table 5.4 illustrates how DNA evidence showed pronounced effects on whether a case reached court and whether a jury found the accused guilty. If the case configurations are known, the calculations of conditional probability offer answers to
questions such as “Will the case reach court?” and “Will a jury convict or exonerate?”. The groups of cases in Table 5.4 illustrate how, in different case configurations, DNA evidence will alter the predicted court outcome, while in other cases, it will make little difference. Case scenarios with conditional predictions for guilty pleas were omitted, as in the bivariate analysis DNA was calculated not to be a predictor of these outcomes. Case scenarios for the imposition of custodial penalties were also omitted, because all penalties were custodial.

In Case 1, where the defendant was female, the addition of incriminating DNA evidence increased the conditional probability from 0.66 to a much more robust 0.97. In Case 2 with a male defendant, the prosecution’s inclusion of DNA evidence made less difference to whether the case reached court, as the conditional probability value only increased from 0.91 to a near certainty of 0.99. From Table 5.3, it can be seen that the model correctly classified 93% of cases as to whether they would reach court. Case 3 illustrates how the addition of incriminating DNA evidence altered the conditional probability from 0.15 across the 0.50 threshold to 0.80; that is, from a finding of not guilty to guilty.

In Case 4 also, DNA evidence altered the predicted jury finding as it increased the conditional probability from borderline exoneration of 0.49 to a far more substantial probability of conviction of 0.96. In the final case in Table 5.4, the addition of DNA evidence acted to strengthen the probable outcome of conviction. The model correctly classified 81% of cases decided by juries. Cases decided by juries but not correctly classified would be influenced by individualising factors other than those taken into account by the model. These could include the effectiveness of defence and prosecution counsel, the nature of witness testimony, presence and types of directions given to the jury by the judge, and legal defences raised.

Analysis and discussion: findings in relation to hypotheses

Effects on cases reaching court

Two independent variables were found to be significant predictors of cases reaching court: DNA evidence and the accused being male. The first hypothesis was therefore validated. DNA evidence did lead to a higher proportion of homicide cases reaching
court. However, as only 11 cases did not go to trial, caution is advised in interpreting results from the exclusion of such a small number. Table 5.4 indicates that DNA evidence was a significant predictor of decisions by the Office of the Department of Public Prosecutions (DPP) to prosecute, with the odds ratio showing that such cases were much more likely to reach court than cases without DNA evidence: the odds of a case reaching court were more than fourteen (14.69) times higher where there was DNA evidence than where there was not. Explanations for the other predictor of cases reaching court—defendants being male—were sought in criminological theory and through an examination of the anomalous cases in the sample—those involving female defendants. One theoretical explanation has contended that there is "systematic chivalric bias...which showed women offenders receiving more sympathetic and individualized justice for serious crimes for which men got no comparable understanding" (Heidensohn, 1997: 778; see also Chan, 2001).

An examination of the cases sampled revealed that a high proportion, 124 of 148 known (84%), involved male defendants. Of 26 females charged, however, four of those cases (15%), all from the control group, did not reach court. Two of these cases were infanticides: in one case where a 14-month-old was stabbed to death and the prosecution offered no evidence at committal. The other case involved a "shaken baby syndrome" death. In the latter case, the mother denied responsibility while other persons had access to the child, and the DPP entered a nolle prosequi. Unlike New South Wales, Victoria and Canada, Queensland has never legislated a specific offence of infanticide, where the penalty is commonly non-custodial and includes psychiatric treatment (Potas, 1984: 8).

The other two cases with female accused that did not reach court were related to domestic disputes. In one case, no evidence was offered in the Magistrates Court, while in the other, a nolle prosequi was entered in the Supreme Court. As was found below with jury decisions in DNA evidence cases, females charged with homicides associated with domestic violence were frequently acquitted, thereby supporting the explanation of chivalric bias. It is not unexpected in these two instances then that prosecutors should withdraw such cases due to the perceived likelihood of similar such acquittals.
Effects on guilty pleas

As found with sexual offences by Taupin (1994: iv) and in the previous chapter, DNA evidence did not act as a predictor or have a significant association with guilty pleas for homicide offences overall, or for manslaughter offences. The second hypothesis was therefore discounted. The strongest predictor of a guilty plea in both DNA and non-DNA groups, although negative, was the seriousness of the offence. That is, in comparison to murder offences, the lesser manslaughter offences were more associated with guilty pleas. Other predictors were younger victim age, if the defendant made no statement to police or refused an interview, and if defendants were of Indigenous race (from Table 5.3).

The association between manslaughter charges and guilty pleas was attributed to two factors. First, murder charges did not attract a guilty plea because of the mandatory life sentence imposed in Queensland; that is, defendants could not expect any reduction in the penalty in return for a guilty plea (Zdenkowski, 1994: 171). The imposition of proportionate penalties as a preferable alternative has been proposed (Wood, 1992). Second, many murder cases in which a *nolle prosequi* was entered were found in the criminal history records to be presented in another, later indictment as manslaughter charges, which were in turn accompanied by a guilty plea. This suggests that where defendants are faced with lesser or proportionate sentencing, they would be more inclined to plead guilty.

A second significant but negative predictor of a guilty plea was the age of the victim at the time of the offence. A guilty plea was more likely where the victim was under the median age of 35 years. Cases where victims were under the median age were four times more likely to result in a guilty plea than where victims were older. This result might be influenced by the presence of child victims – eight percent of victims in the sample were aged between four months and twelve years, with guilty pleas entered in nearly all cases. Self-defence or provocation would not be viable defences at trial in such cases, possibly leaving offenders little alternative but to plead guilty. Additional factors that may contribute to the plea decision include remorse at having killed a child (often their own), reluctance to face a public trial and a wish to expedite
the legal process so as to deal with feelings of guilt (Alder and Polk, 2001; Stroud and Pritchard, 2001: 249-269).

A third negative predictor of guilty pleas was where the defendant made no statement to police or refused a police interview. Cases with this variable were over three times less likely to culminate in a plea of guilty than cases where defendants were interviewed. One objective of police interviews is to explore and possibly negate defences of a suspect, as provided for in the exculpatory sections in the Queensland Criminal Code 1899 (see also Victorian Law Reform Commission, 2002). By making no statement or refusing a police interview, often on legal advice, any defence later raised by the accused either can then have the benefit of legal counsel, or the defendant will gain time to prepare a defence strategy.

Where defendants were of Indigenous race, they were marginally more likely to plead guilty than other defendants, instead of opting for trial. Although Indigenous people formed close to three percent of the State’s population at 30 June 1996, they formed 28% of the defendants in the cases sampled (from Table 5.1). According to an opinion about higher plea rates by Dr Jenny Mouzos (2002c), a homicide researcher at the Australian Institute of Criminology,

this may be a function of the actual “type” of homicides committed by Indigenous persons…A comparative analysis of Indigenous and non-Indigenous homicides in Australia revealed that Indigenous homicides are quantitatively different from non-Indigenous homicides – that is, they are more likely to occur between persons known to one another, usually family or intimates, and significantly less likely to involve the use of firearms. Many of them are usually solved quite early in the investigation, as the offender is usually known to the victim and witnesses. While we know that Indigenous homicides are quite different from non-Indigenous homicides, there may of course be other factors responsible for the higher guilty pleas in murder: are solicitors representing Indigenous clients more likely to advise their clients to plead guilty than solicitors representing non-Indigenous clients? … Given the nature of Indigenous homicides,
evidence would not be lacking (i.e., the death of the victim is likely to be brought to the attention of police within a short time after it was committed, instead of days, weeks or even months after the incident) (Personal communication, 20 December 2002 quoted with permission; see also Mouzos, 2001; Martin, 1992; Eames, 1992).

**Effects on jury decisions**

As found with other major offence types in this thesis, DNA evidence in homicide cases was found to exert a strong influence on jurors’ decisions to convict, the odds of a conviction being much higher for cases with DNA than for cases without. Incriminating fingerprints also strongly influenced juries to convict. However, the wide confidence intervals for DNA and fingerprints make any conclusions or predictions that use them of dubious quality, and caution is advised when referring to the model. Juries were responsible for deciding two-thirds of the cases prosecuted (92 of 142 known). In comparing these two methods of identification, Rhonda Wheate, a lawyer researching how well juries cope with complex forensic evidence, believes that for juries, “Fingerprints have the great advantage specifically over DNA evidence in that everybody can see their own fingerprint” (Wheate, 2002).

Other predictors of jury decisions were the sex of the victim and recorded statements, both confessions and denials, by the accused to police. This contrasted with findings about DNA evidence in the chapter on sexual offences and serious assault cases, where confessions acted instead as a predictor of guilty pleas. This is probably best explained, as before, by the mandatory life sentence for murder, where there is no incentive by way of reduced penalty for pleading guilty. So, although having confessed to police, many accused still chose to go to trial. While an accused may plead not guilty in court, a prosecutor’s presentation of a videotaped police record of interview, where the accused has confessed to the crime, can have a decisive influence on a jury, making a conviction more likely than in cases without a confession – the odds of a conviction being six times higher with a confession than without (from Table 5.3).
The seven cases with DNA evidence where juries acquitted were examined to ascertain reasons, isolate common factors, and detect anomalies. Common factors in four of the cases were that the deaths occurred during domestic disputes, and all four accused were Indigenous females. Three of the victims in these cases were males of Indigenous race and one was a male Caucasian. Table 5.2 indicates the significant negative association of such cases with jury convictions, that is, their strong association with acquittals. This association applied both to Indigenous defendants and to female defendants enmeshed with the victim. Killings among Indigenous people have been found to be “more likely to occur within the family environment, with a high proportion of female involvement (both as victims and offenders)” (Mouzos, 2001: 1). In two of the cases sampled the accused refused a police interview, but the other two accused admitted causing the deaths to police.

Theoretical explanations relevant to these cases are available. Bradfield (2001) has studied spousal related homicides by women, particularly in domestic violence situations, emphasising lack of intent and diminished responsibility; while Mouzos (1999, 2001) as noted, has investigated homicides among Indigenous people. The remaining cases where juries acquitted despite DNA evidence were largely circumstantial. One involved the disappearance of Bowen schoolgirl Rachel Antonio and was widely publicised. Comments by counsel for the defence in the appeal illustrate the importance they assigned to DNA evidence:

Case H47:

On Anzac Day 1998, the 16-year-old disappeared on her way to the movies. Despite the absence of a corpus delicti, a case was brought against a man in his twenties, who was alleged to have had a relationship with the missing girl. The suspect denied the offence. A police search of his belongings resulted in a spot of blood being found on a sandal. The blood was profiled for DNA and matched to the profile from hair taken from a hairbrush belonging to the vanished teenager and consistent with DNA samples taken from her relatives. The accused went to trial twice. The first trial ended in November 1999, in the Townsville Supreme Court, with the accused being found
guilty of manslaughter and sentenced to imprisonment for nine years. In August 2000, the Court of Appeal set aside this conviction and ordered a new trial, Ground 8 of the Appeal being a “challenge to DNA evidence” (R v Hytch [2000] QCA 315 at 15-19). In arguing before the Court of Appeal for the conviction to be quashed, Walter Sofronoff QC “argued the DNA evidence was so powerful, from an emotional sense, it had to impact on the jury decision” (Oberhardt, 2000b: 5).

Sofronoff further argued that the blood found on the sandal of the accused could not be aged, and that a jury “would need to consider possible explanations advanced for the presence of her blood on the sandal other than that it got there on the evening she disappeared” (R v Hytch [2000] QCA 315 at para 85). For the Crown, Michael Byrne QC stated that there had been no objection to the DNA evidence during the original trial. A second trial, however, was ordered. In this, the defence introduced its own expert witness to testify on the DNA evidence. The second trial ran for three weeks, and on 16 June 2001 the jury of six men and six women absolved the accused, finding that the Crown had not proved its circumstantial case beyond a reasonable doubt.

Sources: Oberhardt, 2000b: 5; Ketchell, 2001: 4; Scholz, 2001: 3.

In addition to this anecdotal evidence, the third hypothesis, about the impact of DNA evidence upon jurors, was verified from the statistical analysis.

**Effects on custodial penalties**

The gravity of the offences in homicide cases ensured that all found guilty were incarcerated, whether for murder or for manslaughter. In effect, a guilty verdict was the sole predictor of custodial penalties. DNA therefore was not tested as a predictor of custodial penalties. The only case encountered where imprisonment was not imposed was not included in the sample studied, as it did not meet the selection criterion listed earlier for adult penalties because it involved a child offender. In that
case, a 13-year–old who was babysitting her 4-year-old stepbrother smothered him in an attempt to stop him crying (QPS CRISP). A two-year good behaviour period was imposed.

**Effects on length of penalty: manslaughter cases**

The degree of association between DNA evidence and the length of custodial penalties imposed was tested statistically. A bivariate correlation showed that the DNA evidence had a slight negative, but not significant, association with length of custodial penalties in manslaughter cases. The analysis was based on the 15 manslaughter cases heard in court, where judges were aware of the nature of the evidence, and where a custodial sentence followed. DNA evidence did not show any significant statistical association with increased penalty length for manslaughter cases, so no empirical support was found for the fourth hypothesis in homicide cases.

**CONCLUSION**

This chapter found that in homicide cases in Queensland, DNA evidence presented by prosecutors acted as the most significant predictor of cases reaching court, followed by whether the defendant was male (from Table 5.3). For explaining guilty pleas, the most important variable was the seriousness of the charge: the accused were four times more likely to plead guilty to a manslaughter charge than to one of murder, most likely because of the mandatory life sentence attached to murder. Prior to 1 July 1997, those serving a “life” sentence in Queensland were not eligible for parole for 13 years, and after that date, 15 years, while for two murders the penalty was 20 years. Defendants were also more likely to plead guilty where they were of Indigenous race or where victims were younger. Guilty pleas were less likely where the accused had made no statement to police. As with the control-comparison studies of sexual offences and serious assaults involving DNA evidence, there was no statistically significant association found between DNA and guilty pleas in the homicide cases sampled.

Juries were found more likely to convict where the prosecution used DNA evidence than when it did not, while fingerprint evidence and a confession added to the likelihood of a guilty finding. On the other hand, juries were more likely to acquit
where the accused had denied guilt in a police record of interview or was female. The addition of DNA evidence in particular case configurations was found to alter the predicted jury decision from an acquittal to a conviction, but DNA evidence demonstrated no significant association with length of sentences in manslaughter cases. Policy implications from these findings on defendants’ plea decisions are that legislators may need to consider alternative sentencing options: proportionate sentencing may be appropriate in some situations, such as domestic homicides where diminished responsibility is shown. From the findings on cases with child victims, a separate offence of infanticide, as legislated in southern States, may be worth considering for Queensland.
CHAPTER 6: EFFECTS ON SERIOUS ASSAULT CASES IN COURT

INTRODUCTION

Whereas previous chapters examined the effects of DNA evidence on sexual offences and homicide cases, this chapter analyses primary data to find how incriminating DNA evidence impacted on serious assault cases as they progressed through the criminal courts. The chapter initially provides a context for serious assault offences by reviewing previous findings and statistics on assaults, and it relates numbers of reported assaults to numbers of cases referred for laboratory analysis. A statistical analysis is then made of a sample of 200 solved and completed cases in the jurisdiction of Queensland. Half of the cases selected utilised DNA evidence, while the other half acted as a control group and did not. The effects examined were those on decisions by prosecutors about whether to proceed to court or to nolle, effects on guilty pleas by defendants, and effects on jury verdicts. Forensic DNA is then assessed as a predictor during the sentencing stage of custodial sentences, and as a predictor of variations in penalty length. As in previous chapters, these effects of DNA evidence were examined within a context of other evidentiary and extra-legal factors that may also have had a bearing on case outcomes.

Background

Assaults, particularly serious assaults, inflict emotional damage to victims and to their families, in addition to the financial and social costs to the community. Medical treatment, time spent in hospital, loss of income for victims, work absence costs to employees and criminal justice costs are all associated with such violence. According to the Australian Institute of Criminology (AIC), the number of assaults in Australia grew by an average of 5% each year between 1995 and 2002. This was almost five times the annual population growth in the country during the same period (AIC, 2003b: 28-29). Assaults were found to occur at a rate of 811 per 100,000 population in Australia in 2002. In Queensland, higher levels of public concern have followed
regular media reports of the levels of violence in the community, engendering a fear of personal safety, particularly among the more vulnerable: the elderly, women and children. Not only is this fear associated with assaults in public places, but also there is rising concern about violence in the home. The majority of female victims (57%) were reported to have been assaulted in residential premises (AIC, 2003b: 28).

Despite the fears of the elderly, the groups at greatest risk of being assaulted were young people, especially teenagers, males, single people, the unemployed and Indigenous people. For young people, one Queensland study found that the risk is higher in places of public entertainment at night from their peers (Homel and Mirrlees-Black, 1997: 1, 11). Incidents of violence are also concentrated around places where alcohol is consumed or is available nearby, mostly on weekends and usually late at night (Teece and Williams, 2000: 2). Thirty seven percent of assaults in 2002 were found to happen in community locations, with those on streets or footpaths accounting for 23%. In 2002 assaults also occurred frequently in residential locations (41%), with 35% occurring in private dwellings (AIC, 2003b: 26).

One study of serious assaults in Queensland in 1996-97, found eight males per 1,000 aged 15 to 24 years were victims, compared with less than six females in 1,000 in the same age group (Government Statistician’s Office, 1998: 2). A US study on trace evidence noted that blood was found at approximately 60% of serious assault cases (Parker and Peterson, 1970: 517). The success rate for obtaining DNA profiles from blood samples taken from crime scenes is reported at around 90% (Wilson-Wilde, 2001: 4).

As with sexual offence cases, the number of serious assaults in Queensland where evidence is submitted to the laboratory for DNA profiling is relatively small when compared with numbers of reported offences. In the thirteen financial years from 1990-91 to 2002-03, the average annual number of serious assault cases referred by police for DNA testing was 153, with the minimum number being 43 in 1990-91 when profiling began in Queensland, and the maximum of 336 reached in 2002-03 (QHSS, Annual Reports). In 2002-03, the number of assaults reported to police was 19,420, with 13,979 or 72% cleared by police in the same period. Reported serious
assaults that year numbered 11,533 (QPS, 2003a: 2-3). Less than two percent of such offences overall were therefore referred for DNA profiling in 2002-03, a proportion that was not exceeded in any of the previous twelve years. Among all referred cases for various offence types, laboratory scientists supplied court statements in around 20%, suggesting that DNA evidence was used in court in less than one half of one percent of reported assault cases. The presence of DNA evidence in terms of overall offence numbers in both the investigative and the court processes is, therefore, extremely limited. Where incriminating DNA evidence was provided to the courts, its effects are discussed below. No previous empirical studies were located where the effects of DNA evidence on serious assaults in court were examined, although a US National Institute of Justice sponsored study, prior to DNA use, found that:

The effects of scientific evidence on the clearance and prosecution of aggravated assault cases is less pronounced and, in many cases, not significantly different from cases where forensic evidence is not used (Peterson et al., 1984: iv).

**Hypotheses to test**

Consistent with the listing in Chapter 3, the following hypotheses were tested for serious assault offences:

- That a higher proportion of cases reach court where DNA evidence is presented by prosecutors;
- That more guilty pleas result where suspects are confronted with DNA evidence associating them with complainants or crime scenes;
- That a significant relationship exists between DNA evidence implicating the accused and the likelihood of a conviction;
- That incriminating DNA evidence is associated with more custodial penalties;
- That longer custodial penalties are imposed where incriminating DNA evidence is presented.
Method

The research method adopted is the same as that utilised in Chapters 4 and 5, and is briefly outlined once more. To analyse the effects of DNA evidence on serious assaults during the court process, a sample of 200 serious assault cases was selected. One hundred cases that utilised DNA evidence were selected from Queensland Health’s forensic biology laboratory files, along with a control group of 100 similar types of cases taken from computerised police records. This sample population of 200 cases was of sufficient size in relation to the number of predictor variables to allow significant relationships to be calculated statistically (Tabachnick and Fidell, 2001: 521-2). The DNA cases covered offences that occurred between 14 January 1996 and 3 December 1999. The last date was the most recent case for which court results were available when data were collected both in 2001 from the forensic laboratory and during 2002 from the Police Information Centre. Proceeding back in time, every available DNA case file was then scrutinised and included if it met the further selection criteria until a sufficient number of cases were obtained.

To maintain parity with the DNA group, the non-DNA cases were then chosen from within the same time frame, to place them in a contemporaneous social and legal environment, and largely to meet the same criteria as listed below. The procedure followed in order to develop the control group was to assign the same classification codes allocated by the Crime Recording Information System for Police (CRISP) to the DNA cases, then search CRISP for non-DNA cases with the same classification codes and within the same time frame. When such cases were located, provided they met the remaining selection criteria (except for the second), they were included in the sample.
The selection criteria were:

- that the cases be completed so that they could be tracked to finality in the justice process, that is, past the appeal stage in the courts;
- that a forensic laboratory scientist had produced a sworn court statement in which the defendant was associated through DNA profiling with either the complainant or the crime scene;
- that no defendants were subject to penalties for juveniles (which can be different from those for adults);
- that police and court records could be located;

Again, the control group was not a random sample, as was the DNA group (within the limits of the selection criteria), but instead, a sample with characteristics matched to the DNA group in order to mirror it and thereby minimise any biases due to other variables when conducting a comparison.

An essential measure of parity between both groups in the sample was for the seriousness of the offences and for the number of charges laid. This was done to ensure that incidents referred for DNA analysis were no more serious that those selected for the control group. An eight level scale of offence seriousness was used initially, where eight was the highest in the hierarchy of offences (attempted murder) and one was the lowest (common assault). This scale was based on the “order of seriousness of offence types” as set out in Appendix 6 of the Queensland Government Statistician’s Office publication *Crime and Justice Statistics, Queensland, 1997* (1999: 58-9):

1. Common or simple assault
2. Aggravated assault; assault police; unarmed robbery
3. Dangerous driving; burglary with breaking (“home invasion”)
4. Unlawful wounding; assault occasioning bodily harm
5. Armed robbery; arson (with harm or potential harm to person/s)
6. Burglary with violence or threats; torture
7. Causing grievous bodily harm
8. Attempted murder
A small number of other serious offences against the person other than direct assault were included in the sample, such as dangerous driving and arson, where defendants were charged with deliberately causing injury. A measure taken was the mean value of seriousness. For DNA cases this value was 5.18 and for non-DNA cases the value was sufficiently close to achieve valid results at 5.13. The distribution of case seriousness in the DNA group was bimodal due to a clustering of offences in the categories of unlawful wounding (at level 4) and causing grievous bodily harm (level 7). Offences of this type lent themselves well to DNA profiling, usually due to the availability of the victim’s blood. These bimodal peaks were reflected in the non-DNA control group, where a similar number of serious assault and assault causing bodily harm offences, also rated at level four, were selected for inclusion. Types of grievous bodily harm cases without DNA evidence included cases where victims suffered broken bones or were blinded by punches to the eye.

For the purpose of later logistic regression analysis, the eight-scale measure for the seriousness of the offence was collapsed into binary form. The median level of offence seriousness was chosen as the divide, with the 100 offences below that level being classified as 0 and those above as 1. For DNA cases the average number of charges laid was 2.15, while for non-DNA cases the figure was 1.80 charges. The number of charges was also converted to binary form with the median as the divide. Half the cases involved only one charge, and this was coded as 0, while the other half, which had more than one charge, was coded as 1.

A listing of descriptors of the independent or predictor variables for the cases sampled are set out in Table 6.1, along with their means and standard deviations where appropriate. The independent variables are divided into four general categories: complainant variables, offence variables, evidence variables and defendant variables. Apart from where indicated on the Table, most predictor variables were dichotomous, with the value of one reflecting inclusion in the category. As not all data were available for every case, one column indicates the number of cases for each variable where data could be found.
Most data were taken from the QPS Crime Recording Information System for Police (CRISP) – which only records if alcohol was involved in an incident, rather than if either the victim or the defendant had consumed alcohol. However, it was ascertained in 74 cases that the victim had been drinking, and this was recorded to allow comparison with the effects victims’ drinking showed in sexual offence cases. The first variable listed in Table 6.1, described as measuring whether the complainant is male, was ascertained in 195 cases. The mean of 0.72 for the variable indicates that 144 complainants were male, 51 were female, and the remaining 5 unknown. SD is the standard deviation; and the minimum value of the variable is 0 (female), while the maximum is 1 (male).

Two variables were initially coded as scale variables: defendant race and defendant statement. The former used a three-part classification for race: Caucasian, Aboriginal or Torres Strait Islander (Indigenous) and other. These were recoded dichotomously using dummy variables by classifying defendants as Caucasian or not (1 or 0), Indigenous or not (1 or 0), and so on. Similarly, the four scale classification for defendant statement was recoded onto “confessed or not” (1 or 0), “denied committing offence” or not (1 or 0) and so on. The ages of the complainant and defendant at the time of the offence were initially recorded in years. These were also later collapsed into binary form, with median ages of 29 and 27 respectively chosen as the divide. Hence for complainants, 29 years of age or less at the time of the offence were coded as 0, and those aged 30 years or more as 1. No breakdown of complainant race is provided, but this did not affect any later analyses.
Table 6.1: Independent Variables Examined: 200 Serious Assault Cases

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Cases</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complainant variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complainant is male (0 = female; 1 = male)</td>
<td>195</td>
<td>0.72</td>
<td>0.45</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Complainant age at time of offence (in years)</td>
<td>178</td>
<td>31</td>
<td>12.2</td>
<td>1</td>
<td>89</td>
</tr>
<tr>
<td>Complainant race</td>
<td>185</td>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Complainant influenced by alcohol or drugs (0 = no; 1 = yes)</td>
<td>74</td>
<td>0.55</td>
<td>0.5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Offence variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most serious offence charged (0 = less serious; 1 = more serious)</td>
<td>200</td>
<td>0.50</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Number of charges in court</td>
<td>195</td>
<td>1.97</td>
<td>1.62</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td><strong>Evidence variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprints (1 = present)</td>
<td>198</td>
<td>0.12</td>
<td>0.32</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Photographs, videos, com-fit (1 = present)</td>
<td>199</td>
<td>0.86</td>
<td>0.35</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Other tangible evidence (1 = present)</td>
<td>199</td>
<td>0.71</td>
<td>0.46</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DNA court statement (1 = present)</td>
<td>200</td>
<td>0.50</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Independent witness(es) to offence (1 = present)</td>
<td>198</td>
<td>0.42</td>
<td>0.49</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Defendant variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant age at time of offence (years)</td>
<td>198</td>
<td>29.54</td>
<td>10.2</td>
<td>16</td>
<td>68</td>
</tr>
<tr>
<td>Defendant employed (1 = yes)</td>
<td>192</td>
<td>0.31</td>
<td>0.46</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant race</td>
<td>192</td>
<td>127 (66%)</td>
<td>49 (26%)</td>
<td>16 (8%)</td>
<td></td>
</tr>
<tr>
<td>0 = Caucasian</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Indigenous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant is male (1 = yes)</td>
<td>200</td>
<td>0.88</td>
<td>0.33</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant statement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = denies committing offence</td>
<td>164</td>
<td>32 (20%)</td>
<td>64 (39%)</td>
<td>24 (19%)</td>
<td></td>
</tr>
<tr>
<td>1 = makes no statement/ refuses interview</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = makes some admissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = confesses to offence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant has prior similar convictions (1 = yes)</td>
<td>184</td>
<td>0.52</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Measures of central tendency and dispersion are listed only for interval level measures. Means also are shown for all binary measures to indicate the proportion of cases in those categories coded “1”.
Effect of DNA evidence on the court process: data analysis

To gauge the effects of DNA evidence on the various decision-making stages in the courts, the same multivariate technique was employed as in the previous chapters. Dichotomous dependent variables were defined as follows.

- Whether the case reached court (coded as 1) or did not (coded as 0);
- Whether the accused pleaded guilty (coded as 1) or did not (coded as 0);
- Whether the accused was found guilty through jury trial (coded as 1) or was not (coded as 0);
- Whether a guilty outcome resulted (coded as 1) or did not (coded as 0);
- Whether a custodial penalty was imposed (coded as 1) or was not (coded as 0).

The only scale dependent variable was length of custodial penalty.

Again, a series of bivariate analyses was conducted initially to explore the relationship between each predictor variable and the dependent variables. These were then followed by logistic regression analyses to provide likelihood ratios and predictor equations.

Results of statistical analyses

Table 6.2 presents the bivariate Pearson correlation coefficients that were calculated in order to determine the significance of these relationships. The “p” values were again set at the conventional significance levels of 0.05 and 0.01.
Table 6.2: Bivariate Pearson Correlation Coefficients between Dependent and Independent Variables – Court Processing of 200 Serious Assault Cases

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Disposition</th>
<th>Court Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reached court (N = 200)</td>
<td>Guilty Plea (N = 181)</td>
</tr>
<tr>
<td>Comp. age (binary)</td>
<td>-0.054</td>
<td>0.098</td>
</tr>
<tr>
<td>Complainant sex</td>
<td>-0.049</td>
<td>-0.106</td>
</tr>
<tr>
<td>Comp. used alcohol</td>
<td>-0.026</td>
<td>-0.157</td>
</tr>
<tr>
<td>Comp. race</td>
<td>-0.045</td>
<td>0.003</td>
</tr>
<tr>
<td>Fingerprints</td>
<td>0.082</td>
<td>0.142*</td>
</tr>
<tr>
<td>Photos, videos, com-fit</td>
<td>-0.011</td>
<td>-0.087</td>
</tr>
<tr>
<td>Tangible evidence</td>
<td>0.010</td>
<td>0.022</td>
</tr>
<tr>
<td><strong>DNA evidence</strong></td>
<td><strong>0.016</strong></td>
<td><strong>0.042</strong></td>
</tr>
<tr>
<td>Defendant age</td>
<td>-0.083</td>
<td>-0.103</td>
</tr>
<tr>
<td>Defendant sex</td>
<td>0.053</td>
<td>0.068</td>
</tr>
<tr>
<td>Def. employment</td>
<td>0.027</td>
<td>-0.121</td>
</tr>
<tr>
<td>Def. Caucasian race</td>
<td>0.075</td>
<td>0.032</td>
</tr>
<tr>
<td>Def. Indigenous race</td>
<td>-0.063</td>
<td>-0.011</td>
</tr>
<tr>
<td>Def. other race</td>
<td>-0.004</td>
<td>0.233**</td>
</tr>
<tr>
<td>Def. confessed</td>
<td>0.099</td>
<td>-0.157*</td>
</tr>
<tr>
<td>Def made admissions</td>
<td>-0.146*</td>
<td>-0.135*</td>
</tr>
<tr>
<td>Deft. denies offence</td>
<td>0.069</td>
<td>0.048</td>
</tr>
<tr>
<td>Deft. no statement</td>
<td>0.029</td>
<td>0.047</td>
</tr>
<tr>
<td>Prior record similar</td>
<td>0.170**</td>
<td>0.125*</td>
</tr>
<tr>
<td>Independent witness</td>
<td>0.108</td>
<td>0.193**</td>
</tr>
<tr>
<td>No. of charges</td>
<td>0.016</td>
<td>0.113</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01.
For the outcome in the first column – whether or not cases reached court – only two variables were significantly correlated. Cases were not proceeded with, in either the District Court through a *nolle prosequi*, or in the Magistrates Court through “no evidence to offer” (NETO) or a “no true bill”. The two independent variables significantly correlated were, in decreasing order of strength, testimony of one or more independent witnesses other than the victim, and secondly, the defendant denying the offence to investigators. While evidence from independent witnesses had a positive correlation with cases reaching court, the defendant’s denial provided a negative correlation, and the case was less likely to reach court.

This last finding follows the same logic but is the opposite in direction to confessions to police leading to guilty pleas. The main issue and difficulty in serious assaults for investigators is reconstructing events as they actually happened. If a suspect denies either the events or the victim’s version, with no witnesses, police only have one person’s word against another’s about what transpired. This is unlikely to make a strong case. The result from the sample of cases is also affected by half of those sampled having no DNA evidence that might corroborate a victim’s recounting. For the half with DNA evidence available, this may only partially assist to corroborate a victim’s story. Intent can also be at issue. Among these considerations DNA evidence takes a lesser role.

DNA evidence alone is unable to prove guilt if, for example, A assaults B in a melee, and B’s blood splatters C. It is often only if the suspect makes admissions, rather than denies the offence, that the case is more likely to go to court. This reasoning contrasts with that applied to alcometer breath analysis evidence. If a driver’s breath analysis indicates that they well over the legal limit, and they claim to have had only two drinks, this can prove they are lying and will taint the credibility of anything else they might say to police or in court. A driver’s denial in the face of alcometer analysis, may therefore help convict them of a drink driving offence. DNA in serious assault cases, however, acts quite differently.
DNA evidence had a positive, but not significant, association with both cases reaching court and with the second outcome, pleas of guilty. The outcome examined in the second column – whether or not the defendant entered a plea of guilty – produced six independent variables that were significantly correlated. The strongest, which correlated positively, was a confession to the police by the defendant. This finding suggests that solid traditional police work, along with people available to help with enquiries, rather than forensic DNA as claimed by politicians, was instrumental in resolving serious assault cases. Other positive correlations were independent witnesses, the number of charges preferred and identification of defendant’s fingerprints.

Two factors showed a significantly negative correlation with a plea of guilty. These were if the defendant had denied the offence when interviewed by police or had “made some admissions”. The latter classification is differentiated from confessing. Examples from cases sampled are a defendant admitting that they were at the scene at the time of the crime but suggesting that another person committed it; or in an unlawful wounding case, a defendant admitting to striking the victim with his hand during a bar-room brawl, but claiming that the offence was an accident as he had forgotten he was holding a broken glass.

For the outcome in the third column – cases in which the accused faced a jury trial and was convicted – four independent variables were significantly correlated. DNA evidence was a significant positive factor among these along with “tangible evidence” and complainant age. “Tangible evidence” for serious assault cases was defined as weapons exhibited in court, injuries obvious to police, or a substantiating medical report. An unexpected finding was that jury convictions showed a negative correlation with testimony by independent witnesses. The reason for this may lie in the common defence tactic of attempting to undermine the prosecution case by casting doubt on witness testimony. The defence may foster doubt by concentrating on minor inconsistencies between oral testimony and written statements, seizing on and exploiting any contradictions in testimony, even about peripheral matters, and focusing minutely upon matters of detail (Cretney and Davis, 1995: 143).
Of the 200 cases sampled, 15 had no evidence to offer (NETO) in the Magistrates Courts or were finalised through a *nolle prosequi* in the higher court, resulting in 185 cases reaching court. In 32 of the 200 cases, records accessed did not indicate whether finalisation was through a plea or trial, but 16 were recorded as guilty outcomes and 16 otherwise. Of the 181 known cases, 125 pleaded guilty, and 56 did not. Of 28 cases known to go before juries, there were 10 acquittals and 18 convictions. The overall result from the 200 cases was 159 convictions (guilty pleas plus jury decisions) and 41 non-convictions (jury acquittals plus NETO/nolles). Of the 159 convictions the offender was incarcerated in 138 instances.

In order to evaluate the effects, if any, of DNA evidence on sentencing decisions, only the 18 cases that were heard in the District Court by the sentencing judge and that resulted in a guilty verdict were included in the analysis. Cases with guilty pleas were excluded, because according to the DPP, in guilty plea cases the prosecution does not present the evidence. Since the sentencing judge is not necessarily aware of the inclusion of any DNA evidence against the accused, it cannot form an independent variable (see p. 117 above). The analysis of whether or not a custodial penalty was imposed was based on these 18 cases, and in 17 of them the offender was imprisoned. This led to the conclusion that a high proportion of offenders found guilty of serious assaults are imprisoned irrespective of the nature of the evidence.

To test any effects of DNA evidence on the length of sentence, the 17 cases with custodial penalties were analysed. In a bivariate analysis not shown in the Tables, it was found that DNA evidence had no significant correlation with the length of sentences imposed in serious assault cases. The analysis was of a limited sample of 12 DNA cases and five non-DNA, and it returned a slightly positive result of 0.096, even though the non-DNA group rated at 6.00 on the eight-level scale of seriousness, compared to the DNA group rating of 5.33. However, because DNA did not return a high correlation co-efficient, it was concluded that because of this weak association it could not act as a predictor of sentencing length. No further analysis of the other variables that influenced sentencing was conducted.
Multivariate analyses were then conducted as in the previous chapter for the three stages of cases reaching court, of guilty pleas and of jury decisions. These analyses related independent predictor variables to the three outcome stages. Table 6.3 shows the results of the logistic regression analyses. Logistic regression models were again created using SPSS version 9.0 for Windows software. Significant variables from the bivariate analyses were entered or removed one at a time. Only the independent variables were retained that were statistically significant below the 0.10 level while interacting with one another in the regression model. By being incorporated simultaneously in the model, the variables controlled for each other’s effects.
Table 6.3: Significant Predictor Variables from Logistic Regression Analysis: Serious Assault Cases.

<table>
<thead>
<tr>
<th>Court Process</th>
<th>Predictor</th>
<th>Beta</th>
<th>Sig. of Beta</th>
<th>S.E.</th>
<th>Odds ratio</th>
<th>95% C.I.</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reached court (N = 200)#</td>
<td>Independent witness</td>
<td>1.30*</td>
<td>.0235</td>
<td>0.57</td>
<td>3.66</td>
<td>1.19</td>
<td>11.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>1.68</td>
<td>.0000</td>
<td>43.07</td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td></td>
<td>89% cases correctly classified</td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td></td>
<td>Pseudo R²= 6%</td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td></td>
<td>X²= 6.3 (sig. .0122)</td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td>Guilty Plea (N = 181)#</td>
<td>Deft confesses</td>
<td>1.57**</td>
<td>.0035</td>
<td>0.54</td>
<td>4.81</td>
<td>1.67</td>
<td>13.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. of charges</td>
<td>1.07**</td>
<td>.0072</td>
<td>0.40</td>
<td>2.91</td>
<td>1.34</td>
<td>6.32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Independent witnesses</td>
<td>0.43</td>
<td>.0555</td>
<td>0.22</td>
<td>1.53</td>
<td>0.99</td>
<td>2.38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>-0.24</td>
<td>.0002</td>
<td>0.31</td>
<td> </td>
<td> </td>
<td> </td>
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<tr>
<td></td>
<td>77% cases correctly classified</td>
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<td> </td>
<td> </td>
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<td> </td>
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<tr>
<td></td>
<td>Pseudo R²= 18%</td>
<td> </td>
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<td> </td>
<td> </td>
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<tr>
<td></td>
<td>X²= 20 (sig. .0002)</td>
<td> </td>
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<td> </td>
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<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td>Jury convicts (N = 28)</td>
<td>DNA evidence</td>
<td>1.54</td>
<td>.0707</td>
<td>0.85</td>
<td>4.67</td>
<td>0.88</td>
<td>24.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>0.15</td>
<td>.0599</td>
<td>0.56</td>
<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td></td>
<td>68% cases correctly classified</td>
<td> </td>
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<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td></td>
<td>Pseudo R²= 16%</td>
<td> </td>
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<td> </td>
<td> </td>
<td> </td>
<td> </td>
</tr>
<tr>
<td></td>
<td>X²= 3.5 (sig. .0599)</td>
<td> </td>
<td> </td>
<td> </td>
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<td> </td>
<td> </td>
<td> </td>
</tr>
</tbody>
</table>

p* < .05; **p < .01.

Note for Table 6.3: Not all data were available for every case. It was known for 181 cases whether guilty pleas were entered, but in only 175 of those cases was it known if the defendant confessed or not. In the 28 cases decided by juries, however, data for the one independent predictor variable, presence of DNA evidence, was available for all cases.
No logistic regression analysis was conducted for the imposition of custodial penalties. In all cases except one, which was from the DNA group, custodial penalties were imposed. The fact that only one case in 18 was without a custodial penalty did not allow a logistic regression analysis of predictive influence of the effect of DNA, or any other variables, on outcomes, as they would all strongly predict the imposition of a custodial penalty. The conclusion for serious assault cases heard in court that resulted in a guilty finding was that the offender would be imprisoned irrespective of the presence of incriminating DNA evidence in nearly all cases.

In Table 6.3, as in the previous chapters, the “Predictor” column displays the independent variables that most strongly influenced the court process listed in the left column. The “Beta” column shows the logistic regression coefficient, “S.E.” is the standard error, while the “Odds ratio” is the exponentiate of the Beta value. The “Odds ratio” indicates the likelihood of a particular outcome where a designated variable is present in a case. For example, when a suspect confessed to police, he or she was then much more likely to enter a guilty plea. The odds of doing so were nearly five times (4.81 times) as great as when there was no confession. The lower and upper 95% confidence intervals are reported for the odds ratio results.

As also seen previously, “cases correctly classified” gives a percentage of how accurately the model will correctly classify cases overall. For example, in 100 cases where we know whether there was one or more independent witness to the offence, the model would correctly predict for 89 cases whether or not the case would go to court. The pseudo measure of explained variation (Nagelkerke R^2) is provided, and for guilty pleas this was 18%. As found with sexual offences and homicides, DNA evidence demonstrated no significant effect in serious assault cases on inducing guilty pleas or as a predictor of such pleas. Table 6.2 confirms that, as with sexual offences, when a confession is made to police it will act strongly as a precursor to a plea of guilty.
Predicting jury decisions

The point at which DNA evidence assumed its greatest strength in serious assault cases was in its influence on jury decisions, where it emerged as the sole predictor of jury findings. A jury was more likely to convict where prosecutors produced DNA evidence than when they did not. The odds for this were more than four (4.67) times as great as for cases without DNA, although the significance at $p = 0.08$ was not strong. The small sample size for numbers of cases that went to trial (N = 28), along with the high upper limit for the confidence interval (24.79), would suggest that this result be treated with caution. In relation to guilty pleas, DNA evidence showed only a low positive correlation of 0.042 (Table 6.2). Expressed as a percentage of known cases, and without accounting for the influence of other variables, 71% of DNA cases culminated in a guilty plea, while for the control group, the figure was slightly less at 67%.

Table 6.3 gives examples to illustrate the effects of DNA evidence as a statistical predictor of the conditional probability of jury convictions, as this was the only stage in the court process where it showed a statistically significant effect. To calculate the conditional probability for a dichotomous outcome when individual case characteristics are known, the formula again used was:

$$\text{Probability} = \frac{1}{1 + e^{-\text{logit}}}$$

where the logit = $B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \ldots + B_kX_k$.

$B$ is the Beta value from Table 6.3, with $B_0$ the constant. A case example demonstrating the difference that forensic DNA can make to jury case outcomes is shown in Table 6.4.
Table 6.4: Conditional Probabilities of court outcomes for various case characteristics (N = 28).

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Logit $B_0 + B_1 + \ldots + B_i$</th>
<th>Probability $\frac{1}{1 + e^{-\text{logit}}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jury Decision of Guilty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without incriminating DNA</td>
<td>-0.15</td>
<td>0.46</td>
</tr>
<tr>
<td>evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With incriminating DNA</td>
<td>1.35</td>
<td>0.80</td>
</tr>
<tr>
<td>evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Correctly classifies 68% of cases)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The example in Table 6.4 illustrates that in serious assault cases that go before a jury the inclusion of DNA evidence can change the predicted outcome from an acquittal to a conviction. Without DNA evidence, the probability of a guilty finding, at 0.46, is slightly less than an even (0.50) chance of a guilty outcome, whereas with incriminating DNA, a 0.80 probability of guilt is well above the threshold. The odds ratio value, however, indicates the chances of a guilty finding by juries with DNA are higher than those without. For serious assault offences, DNA evidence was found not to be a significant predictor of cases reaching court, of guilty pleas or of custodial penalties being imposed. Case scenarios with conditional predictions for these stages of the justice process therefore, are omitted from Table 6.4. Unlike in the previous chapter on sexual offences, where it was found that victim use of alcohol or drugs influenced most stages of the court process, that particular victim variable did not emerge as influential in serious assault cases in court as seen from Table 6.2.
Analysis and discussion: findings in relation to hypotheses

Effects on cases reaching court

DNA evidence in serious assaults showed a positive, but not significant, relationship with cases reaching court. The only significant independent variable to predict if a case would reach court was the presence of independent witnesses. A comprehensive UK study on assaults corroborates this finding:

In the case of assault, certainly, it is difficult to overestimate the importance of witness evidence. In most cases … it was only the availability of independent witnesses … which made a prosecution viable (Cretney and Davis, 1995: 107).

One experienced uniformed police officer questioned in relation to assaults pointed out that reconstructing the events that occurred was often the most difficult part of an investigation. Except in occasional cases where video surveillance evidence was available, independent witnesses were the best source of information in this respect (Rilen, 2002).

Effects on jury decisions

DNA evidence was found to exert a strong influence on jury’s decisions in serious assault cases, where jurors were more likely to convict if prosecutors presented it. However, the influence of DNA was nowhere near as profound as in sexual offence cases. DNA evidence in serious assault cases was almost always obtained from analysis of the victim’s blood, which may have been found on the suspect’s clothing or shoes, at the crime scene, or on a knife or other weapon the suspect was alleged to have used.
Of 28 serious assault cases in the sample that went before juries, 18 resulted in guilty verdicts and 10 in acquittals. Three of the acquittals involved DNA evidence. A review of these three cases is informative, although the exact reasons for the juries reaching their decisions can only be speculated upon or inferred, as jury deliberations are conducted in camera and in Queensland, the interviewing of jurors is legally prohibited. As an alternative, the investigating detectives who acted as case officers were contacted, and all three generously agreed to provide information. The officers’ opinions were that in all cases the juries’ verdicts were swayed by factors beyond the evidence presented in court, and therefore outside the theories of evidence relied upon in this research. They identified those factors as sympathy for one accused due to long-term harassment of his daughter by the complainant; jury prejudice against a victim because of unproven allegations against him of paedophilia; and lastly, directions by the judge to the jury biased in favour of the accused. Outlines of these cases follow, and in compliance with the ethics conditions for this research, names have been omitted.

Case A43.

Facts of the case: At the time of the offence, the male complainant, who was then 26 years old, was seated in the passenger side of a parked motor vehicle. Two of his friends were also in the vehicle. A 55-year-old male was alleged to have stabbed the complainant in the abdomen, also causing a laceration to the victim’s left hand. Detectives located a knife with blood on it at the defendant’s residence and DNA profiling proved the blood had come from the victim. The defendant was charged with two counts of unlawful wounding. Shortly prior to the incident, the car carrying the victim had stopped at traffic lights directly across from the suspect’s car. The victim made faces at the suspect and the car then drove off. The defendant later found where the car carrying the victim was parked, walked up to the vehicle, pulled a knife and stabbed him. The victim’s car drove off before any further stabbing could occur. The defendant had no defence on the grounds of self-defence or even
provocation. The actual reasons for the jury’s decision, though, are not available for scrutiny. The unusual acquittal was described in a front-page local newspaper report headlined “10 years of torment, 10 minutes to find not guilty”.

Sources: Forensic Biology Laboratory Case File F15408; QPS CRISP; Personal communication, Investigating Officer 9 October 2002.

Case A85.

Facts of the case: About 5.15 am the complainant and two friends were walking past another group of young males near a nightclub containing the defendant. The defendant and another male shouted abuse at the complainant and shortly following a scuffle ensued. The complainant was held down in a garden on the footpath and punched repeatedly in the face by the offender. As this was happening, another unknown offender was kicking the complainant, but this offender decamped. Injuries sustained by the complainant included severe bruising to both sides of the face and a badly broken nose.

Sources: Forensic Biology Laboratory Case File F19356; QPS CRISP; Personal communication Investigating Officer, 10 October 2002.

Case A88

Facts of the case: A 16-year-old male was charged by police with causing grievous bodily harm and tried in a District Court for assault causing bodily harm. Along with his father, the defendant drove to the home of another teenaged male, the victim in this case, and they took him away in their car. They drove to a deserted quarry, and the father allegedly said that the complainant deserved a beating. The defendant teenager was alleged to have then struggled with the complainant, pulled him from the car and punched him on the side of the face,
rendering him unconscious. The victim awoke in the back of the car being driven home. The next morning he had a shoe impression on the side of his face, and had sustained three fractures to the cheekbone and jaw that required surgical insertion of a plate. Court evidence included victim photographs, a medical statement and a forensic scientist’s statement about two swabs taken of blood from the back seat and the back of the steering wheel of the car involved. The father was also charged but pleaded guilty to a lesser charge. DNA from the swabs was profiled, but could only be successfully typed in one system, the TH01 type 7/8, which is shared by about 4% of the population. (The TH01 marker is not used in current ProfilerPlus analyses, and its use has been criticised in the UK, as it may act an indicator of diabetes. See Chapter 10).

Background to the case was that both teenagers had previously been convicted conjointly of burglary offences. The father and son blamed the evidence of the other teenager for the convictions, which was the motivation for the bashing.

Sources: Forensic Biology Laboratory Case File F15959; QPS CRISP, Personal communication Investigating Officer, 11 October 2002

In the 1996 study, Convicted by Juries, Exonerated by Science, DNA evidence provided a means of identifying problems and weaknesses in the US justice process from the analysis of wrongful convictions that were later overturned (Connors et al., 1996; see also Chapter 10 this thesis). The case reviews in this chapter suggest the possibility of a companion study, for which Incriminated by Science, Exonerated by Juries might be an appropriate title. Such a study might provide valuable insights into extra-court and other influences on jurors’ decisions by analysing cases and their social contexts where juries acquit – despite incriminating DNA evidence.
**Effects on guilty pleas**

As with sexual offences, DNA evidence did not act as a predictor or have a significant correlation with guilty pleas. Confessions to police by suspects were again the most significant positive predictor of such a plea. Confessions were the only type among the four categories of interview responses by suspects to police that demonstrated any influence as a predictor of court outcomes. The number of charges preferred was also a predictor of a guilty plea. This was most likely due to the additional evidence available that would support the charges and a consequent unwillingness to contest these in court.

An increased number of charges usually indicated more injuries to the victim, that the incident was protracted or that it involved different offence types. Examples include incidents where there were charges of assault occasioning bodily harm plus attempted robbery; attempted murder plus wounding with intent to do grievous bodily harm plus aggravated robbery; abduction and assault with intent to rape; two charges of assault occasioning bodily harm plus entering a dwelling with intent to commit an indictable offence. None of the cases involved minor public order offences such as resisting arrest, obstructing police or obscene language. The number of charges filed was related to the overall seriousness of the case and, as was seen in Table 6.1, there was an average of 1.99 charges per case. The majority of cases sampled, close to 70%, culminated in a plea of guilty.

**Effects on custodial penalties**

Of 18 cases that were heard before the courts where sentencing judges were aware of the evidence, custodial sentences were imposed in 17. This was interpreted to mean that custodial sentences would be imposed in most serious assault cases with guilty findings irrespective of the nature of the evidence. From an analysis not shown in the Tables, the two variables most strongly associated with custodial penalties were if the offender had prior convictions and the seriousness of the charge. The greater the number of charges laid in relation to the offence was also associated with a higher
likelihood of imprisonment. The two strongest predictor variables, prior convictions and seriousness of the charge(s), conform to the intentions of Queensland’s Penalties and Sentencing Act.

**Effects on the length of penalty**

The degree of association between DNA evidence and the length of custodial penalties imposed was tested statistically. A bivariate correlation showed that the DNA evidence had a slight positive, but not significant, association with length of custodial penalties in manslaughter cases, with a value of 0.096. The analysis was based on the 17 cases heard in court, where judges were aware of the nature of the evidence, and where a custodial sentence followed. Because DNA evidence did not show any significant statistical association with increased penalty length, no empirical support was found for the fifth hypothesis in serious assault cases. That is, DNA evidence did not emerge as a significant variable at the point of sentencing as postulated in either the fourth or fifth hypotheses.
CONCLUSION

This chapter found that forensic DNA evidence was used in less than two percent of investigations of serious assault cases in Queensland, and in less than one percent of court cases. The strongest predictor of such cases reaching court was the evidence of independent witnesses other than the victim. This same variable influenced defendants to enter a plea of guilty, although the most important form of evidence for explaining guilty pleas in serious assault cases was a confession by the suspect to police. As was found with sexual offences and homicides, DNA evidence did not demonstrate a significant relationship with guilty pleas in the cases sampled, although the majority of such cases, 68%, culminated in pleas of guilty. Incriminating DNA evidence showed a significant effect on jury findings, emerging as the sole predictor of findings of guilt, although this result was based on a limited number of 28 cases. DNA evidence did not act as a significant predictor of custodial penalties because in almost all serious assault cases with a guilty outcome, the offender was imprisoned; nor was its presence significantly associated with any increase in length of sentence. Three cases where juries acquitted despite incriminating DNA evidence were subject to more detailed examination. It was suggested that extra-court influences and social contexts could be researched in future studies when seeking explanations for the factors that affect jurors’ decisions about guilt and innocence.
CHAPTER 7: EFFECTS ON PROPERTY OFFENCES IN COURT

INTRODUCTION

This chapter continues the assessment of DNA evidence with the examination of its effectiveness in court for property crime cases. By way of background, the levels of property crime in Queensland are outlined from published statistics, while victim surveys are referred to in order to reveal the impact that such offences may have on the community generally, and in particular, on the quality of the life of the victims. The chapter then lists the hypotheses to be tested, and describes how the control-comparison method used previously is applied in this chapter. The strength of the effects of DNA and other evidence types on decisions to prosecute, on decisions by defendants to plead guilty, and on decisions by the courts on guilt or innocence are then analysed.

Background

Property crimes, burglaries of people’s homes in particular, and theft of motor vehicles, are well known to impair quality of life and to impact on community morale. Crimes against property in general though, include a broader range of offence types, which have been categorised for reporting purposes. The Queensland Police Service has provided a breakdown by percentages for each major property crime type for 2002-03 as: Other Theft (42%), followed by Unlawful Entry offences (23%), Other Property Damage (16%), Fraud (10%), Handling Stolen Goods (2%) and Arson (1%). The reported numbers for most property offence types in the State have been declining since around 2000, with an overall decrease for 2002-03 of 7% on the previous year when allowing for population growth. This decline reflects the position in most other Australian States. (AIC, 2003b: 39-40). Property offences were more likely to be committed by males, who comprised 77% of offenders in 2002-03. Over one-quarter of offenders proceeded against in that year were males aged between
fifteen and nineteen years. For unlawful entry offences, 91% of offenders were found to be male, and 70% were males under twenty-five years of age (QPS, 2003a: 12).

In the year ending March 2000, a crime victim survey estimated 5.8% (77,588) of Queensland households were victims of break and enter offences. Those more likely to be victims of such offences, or attempts at such, tended to live in close proximity to public places like hotels, parks, schools, shops and public transport. Nearly four-fifths (78.9%) of such incidents resulted in property being stolen (Office of Economic and Statistical Research, 2001: 2-3). The most recent Crime and Safety Survey suggested that about 44% of people in Queensland perceived housebreaking or burglaries to be a problem in their neighbourhoods, while about one in four considered car thefts to be a problem (Australian Bureau of Statistics, 2003). However, only 76.6% of break and enter victims reported the incident to police. It was found for the same year, that households with incomes over $104,000 had the greatest likelihood of being victimised, and that 1.4% of households had experienced the theft of a motor vehicle. For motor vehicle thefts, 98.1% were reported to police (Office of Economic and Statistical Research, 2001: 2-3). In 2000, rates of recorded crime per 100,000 people for property crimes in Queensland were slightly below the national average, while little difference was found between Queensland crime victimisation rates and those of Australia as a whole (Criminal Justice Commission, 2001: 2).

One measure of the impact of DNA on property crimes was taken by comparing the numbers of reported such offences in Queensland to numbers of cases referred to the laboratory. In 2002-03 police referred samples from 4,894 volume crimes to the State’s forensic laboratory for analysis (QHSS, 2003). In the same year, the Queensland Police Service’s Annual Statistical Review reported 278,995 property offences in the State (QPS, 2003a: 4) and the Police Minister reported a total of 1,100 DNA identifications for all offence types (Queensland State Budget 2003-04: 16). The fact that less than two percent of property crimes were referred to the laboratory, the analysis of which was delayed by a backlog of 15,000 samples at mid-2003 (QHSS Annual Report, 2002-03), would suggest that forensic DNA was having only a minimal impact on property offences in the State to this point in time.
Hypotheses to test

No previous comparative Australian studies were found that examined the effects of DNA on property offence cases in court. However, as was noted in Chapter 3, Martin Gaule (1999) of the UK’s Sussex Police compared outcomes from a pilot group of 308 crime scene DNA samples processed through the forensic laboratory with a turn-around time of 28 days, to a control group of 300 DNA samples with no turn-around time constraints. The rate of guilty pleas for cases in the pilot group, mostly property crime offences, was considered high at 80%, although Gaule made no comparison with rates of guilty pleas in similar non-DNA cases. A New Zealand study that sampled seventeen cases involving 50 burglary charges, five rape offences and one homicide, found that in all cases but one the defendant pleaded guilty (Walsh et al. 2002: 213).

In this chapter, the effects of DNA evidence on property offences in court were examined using Queensland data. Similar hypotheses to those tested in previous chapters were tested based on the proposition that incriminating DNA evidence where available would increase the effectiveness of prosecutions. The hypotheses were:

- That a higher proportion of property offence cases would reach court where DNA evidence was available to prosecutors;
- That more guilty pleas would result where suspects were confronted with DNA evidence associating them with crime scenes or with exhibits like stolen property;
- That a significant relationship would be found between DNA evidence implicating the accused, and the likelihood of a conviction by a magistrate or by a jury;
- That incriminating DNA evidence is associated with more custodial penalties;

The hypotheses were then tested using a control-comparison method as described below.
Method

As in previous chapters, the sample selected for analysis consisted of 200 criminal cases, half of which used DNA evidence. The remaining 100 did not include forensic DNA and provided a control group. The cases with DNA were chosen from Queensland Health’s forensic laboratory case files. The trace biological evidence most commonly located at crime scenes such as burglaries, and from recovered stolen motor vehicles was taken from cigarette butts, from cans and bottles used to consume drinks, from clothing like baseball caps, from blood when perpetrators had cut themselves (for example, on broken window glass) or from syringes left at the scene. Occasionally, chewing gum or partially eaten foods were taken for testing (Wilson-Wilde, 2001: 4; see also Sears, Neal and Robinson, 2002). The range of dates selected for the cases was from 25 March 1994 through to 13 January 2001. The majority of cases sampled occurred during 2000, because the number of property offences at which DNA was collected as evidence was relatively limited in the earlier years, with priority for testing being allocated to more serious offences against the person.

The selection criteria for the cases with DNA were:

- that the cases be completed so that they could be tracked to finality in the justice process, that is, past the appeal stage in the courts;
- that a forensic laboratory scientist had produced a sworn court statement in which the defendant was associated through DNA profiling with either the complainant or the crime scene;
- that police and court records could be located;

Unlike cases selected for analysis for serious offences, it was necessary to include juvenile defendants of 16 years of age or less in the cases chosen. As is in most Western countries, juveniles, who in Queensland are subject to provisions of the Juvenile Justice Act of 1992, were found responsible for committing many of the property offences and therefore constituted a significant proportion of offenders. Under the Act, police officers, usually members of the Juvenile Aid Bureau, may administer a formal caution provided certain conditions, such as a defendant’s making
an admission to the offence, are met. For the purposes of statistical data analysis, such instances were regard for this thesis as pleas of guilty and counted as guilty outcomes.

The control group of 100 property offence cases was chosen from the computerised records of the Queensland Police Service. These were taken from within the same time bracket and jurisdiction in order to place them in a contemporaneous social and legal context and to meet the same selection criteria (in point form above) except for the second. As in earlier chapters, this control group was not a random sample, but was selected to mirror the DNA group as far as possible, in order to minimise biases when conducting comparisons. Data on court outcomes were accessed throughout 2002 via microfilm held at the QPS Police Information Centre, thereby allowing a two-year interval for processing of cases by the courts and for appeals. As in the previous chapters, the sample population of 200 cases was of sufficient size in relation to the number of independent variables to allow significant relationships to be calculated statistically (Tabachnick and Fidell, 2001: 521-2). However, not all variables were found available for every case in the records consulted.

A necessary element of parity between both groups in the sample was a rating for the seriousness of the offences when cases reached their final court hearing. This measure was calculated in order to pre-empt the possibility that only more serious incidents were referred for DNA testing. The thirteen level scale of offence seriousness, where thirteen was the most serious in the hierarchy of offences (robbery under arms) and one was the lowest (unlawful trespass or graffiti) was constructed. This was based on the Australian Bureau of Statistics “order of seriousness of offence types” as set out in Appendix 6 of the Queensland Government Statistician’s publication Crime and Justice Statistics, Queensland, 1997 (1998: 58, 59).

1. Unlawful trespass; graffiti.
2. Vehicles: enter with intent or steal from.
4. Robbery, unarmed.
5. Stealing from dwelling houses.
6. Enter with intent, other premises, with breaking.
7. Enter with intent, shop, with breaking.
8. Burglary with breaking.
9. Driving causing Grievous bodily harm.
10. Robbery, unarmed, in company.
11. Burglary with violence or threats.
12. Burglary with violence or threats, with breaking.
13. Robbery under arms.

The mean value of “seriousness”, based on the charges finally faced in the District Courts, was calculated on this thirteen-tiered scale. For DNA cases this value was 6.54 and for non-DNA cases was 6.67. These values were sufficiently close to achieve valid results, with the non-DNA cases rating a slightly higher degree of seriousness. This confirmed that the cases referred for profiling were no more serious than the non-DNA cases, thereby avoiding a bias towards the DNA cases in the comparison. The distribution of the offences was such that the burglary type offences, numbers 5 to 8 on the scale, accounted for 73.5% of cases overall, 73 being DNA cases and 74 non-DNA. The vehicle offences, numbered 3 on the scale, formed a further five percent overall. Hence, common volume crime formed close to 80% of the sample.

A listing of descriptors of the independent or predictor variables for the cases sampled are set out in Table 7.1, along with their means and standard deviations where appropriate. The independent variables are divided into three general categories: offence type variables, evidence variables and defendant variables. As the offences were primarily directed towards property, no complainant variables were included, as victims comprised not only persons, but businesses and government departments. Social data, such as age, race and sex of defendants were obtained from QPS sources and recorded, as these may also have had a bearing on case outcomes (White and Perrone, 1997: 91-101).
An additional category of “immediate arrest”, not used in previous chapters, and defined as arrest occurring within 24 hours, was added for property offences, so as to include offenders “caught in the act” by, for example, rapid response policing. Apart from where indicated on the Table, most predictor variables were dichotomous, with the value of one (1) reflecting inclusion in the category. As in previous chapters, dummy variables were used for defendant race and for police interview statement. Where independent variables were not dichotomous, such as seriousness of offence or offender age, they were collapsed into binary form. For seriousness of offence, the median was used as the divide, while offender ages were separated into juveniles, aged 16 years or less, with the remainder as adults. As not all data were available for every case, a column is included to indicate the number of cases for each variable where data were available.
### Table 7.1: Independent Variables Examined: 200 Property Offence Cases

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>No of valid Cases</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Offence Type Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most serious offence charged</td>
<td>200</td>
<td>6.61</td>
<td>2.47</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>13 = Robbery under arms</td>
<td>4 (2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 = Burglary with violence and breaking</td>
<td>6 (3%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 = Burglary with violence or threats</td>
<td>19 (9%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 = Robbery unarmed in company</td>
<td>2 (1%)</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>9 = Driving causing grievous bodily harm</td>
<td>21 (11%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 = Burglary with breaking</td>
<td>47 (24%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 = Break and enter shop with intent</td>
<td>27 (14%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 = Break and enter other with intent</td>
<td>52 (26%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 = Stealing from dwelling houses</td>
<td>3 (2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 = Robbery, unarmed</td>
<td>4 (2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = Unlawfully use, steal motor vehicle</td>
<td>5 (3%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = Enter or steal from vehicles</td>
<td>4 (2%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Graffiti, drink driving</td>
<td>6 (3%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Evidence Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprints (1 = present)</td>
<td>199</td>
<td>0.15</td>
<td>0.35</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DNA court statement (1 = present)</td>
<td>200</td>
<td>0.50</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Independent witness(es) to offence (1 = present)</td>
<td>197</td>
<td>0.35</td>
<td>0.48</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Photographic or video evidence (1 = present)</td>
<td>198</td>
<td>0.61</td>
<td>0.49</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Tangible evidence (1 = present)</td>
<td>198</td>
<td>0.38</td>
<td>0.49</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Immediate arrest (1 = arrest within 24 hours)</td>
<td>195</td>
<td>0.23</td>
<td>0.42</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Defendant Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant age at time of offence (years)</td>
<td>198</td>
<td>22</td>
<td>7.6</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>Defendant employed at time of arrest (1 = employed)</td>
<td>194</td>
<td>0.15</td>
<td>0.36</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant race</td>
<td>195</td>
<td>132</td>
<td>(68%)</td>
<td>53</td>
<td>(27%)</td>
</tr>
<tr>
<td>0 = Caucasian</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = Indigenous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant is male (0 = female; 1 = male)</td>
<td>199</td>
<td>0.93</td>
<td>0.25</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Defendant statement:</td>
<td>176</td>
<td>1.74</td>
<td>1.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = denies committing offence</td>
<td>13 (7%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = makes no statement/ refuses interview</td>
<td>86 (49%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = makes some admissions</td>
<td>10 (6%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 = confesses to offence</td>
<td>67 (38%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defendant has prior convictions for similar (1 = has priors)</td>
<td>193</td>
<td>0.93</td>
<td>0.25</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Measures of central tendency and dispersion are listed only for interval level measures. Means also are shown for all binary measures to indicate the proportion of cases in those categories coded “1”.

163
Effect of DNA evidence on the court process: Data analysis

To gauge the effects, if any, of DNA evidence on the various decision-making stages in the courts the same multivariate technique was employed as in previous chapters. Dichotomous dependent variables were defined as:

- Whether the case reached court (coded as 1) or did not (coded as 0);
- Whether the accused pleaded guilty (coded as 1) or did not (coded as 0);
- Whether there was a court outcome of guilty (coded as 1) or not (coded as 0);
- Whether a custodial penalty was imposed (coded as 1) or not (coded as 0).

The only dependent scale variable was length of custodial penalty, and only values other than zero were included in the analysis, so that for example, sentences for offenders detained until the rising of the court were excluded. A series of bivariate analyses was conducted to explore the relationship between each predictor variable and the dependent variables. These were then followed by logistic regression analyses to provide likelihood ratios and predictor equations.

Results of statistical analyses

Table 7.2 shows the bivariate Pearson correlation coefficients examined to determine the significance of these relationships. The three columns in the Table provide the coefficients for the disposition; that is, whether or not cases reached court, and for court outcomes. Although data on disposition were found for all 200 cases, whether or not a guilty plea was entered could be ascertained from the criminal histories consulted only in 170 cases. However, data on an overall outcome of guilty were found in 196 cases. The 26 cases for which there were guilty outcomes but the plea type was unknown may have been summary trials, the matters may have been dealt with ex officio, the charge or charges may have been tried in a higher court or before a jury, or some may have been guilty pleas.
For this analysis, as in previous chapters, dummy variables were used for defendant race and for defendant statement. The scale variable for offence type was also converted to binary form, with cases at levels 1 to 6 on the scale designated zero and levels seven to thirteen rated at one. The “p” values were set at the conventional significance levels of 0.05 and 0.01.

Table 7.2: Bivariate Pearson Correlation Coefficients between Dependent and Independent Variables – Court Processing of Property Offence Case

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Disposition</th>
<th>Court Outcome</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reached Court (N = 200)</td>
<td>Guilty Plea (N = 170)</td>
<td>Guilty Result (N = 196)</td>
</tr>
<tr>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seriousness of offence</td>
<td>-0.012</td>
<td>0.023</td>
<td>0.020</td>
</tr>
<tr>
<td>Fingerprint evidence</td>
<td>-0.073</td>
<td>-0.168*</td>
<td>-0.077</td>
</tr>
<tr>
<td>DNA evidence</td>
<td>0.204**</td>
<td>0.193**</td>
<td>0.182**</td>
</tr>
<tr>
<td>Independent witness(es)</td>
<td>0.002</td>
<td>-0.022</td>
<td>-0.030</td>
</tr>
<tr>
<td>Photographic evidence</td>
<td>0.131*</td>
<td>0.102</td>
<td>0.110</td>
</tr>
<tr>
<td>Tangible evidence</td>
<td>0.023</td>
<td>0.056</td>
<td>0.025</td>
</tr>
<tr>
<td>Immediate arrest</td>
<td>0.118*</td>
<td>0.142*</td>
<td>0.123*</td>
</tr>
<tr>
<td>Defendant age at time of arrest</td>
<td>0.050</td>
<td>-0.106</td>
<td>-0.083</td>
</tr>
<tr>
<td>Defendant employed</td>
<td>0.006</td>
<td>-0.134*</td>
<td>-0.043</td>
</tr>
<tr>
<td>Defendant Caucasian race</td>
<td>0.008</td>
<td>0.072</td>
<td>0.004</td>
</tr>
<tr>
<td>Defendant Indigenous race</td>
<td>-0.011</td>
<td>-0.072</td>
<td>-0.008</td>
</tr>
<tr>
<td>Defendant Other race</td>
<td>0.005</td>
<td>-0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>Defendant is male</td>
<td>-0.096</td>
<td>-0.098</td>
<td>-0.098</td>
</tr>
<tr>
<td>Defendant confessed</td>
<td>-0.002</td>
<td>0.053</td>
<td>0.034</td>
</tr>
<tr>
<td>Defendant made admissions</td>
<td>0.010</td>
<td>0.009</td>
<td>0.010</td>
</tr>
<tr>
<td>Defendant denies offence</td>
<td>0.024</td>
<td>-0.086</td>
<td>-0.048</td>
</tr>
<tr>
<td>Defendant makes no statement</td>
<td>-0.008</td>
<td>-0.006</td>
<td>-0.006</td>
</tr>
<tr>
<td>Prior record similar</td>
<td>-0.026</td>
<td>0.051</td>
<td>0.051</td>
</tr>
<tr>
<td>Number of charges</td>
<td>0.004</td>
<td>0037</td>
<td>0.043</td>
</tr>
<tr>
<td>Guilty plea</td>
<td>N/A</td>
<td>N/A</td>
<td>0.941**</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01.
Three independent variables can be seen in the first column of Table 7.2, “Reached Court”, to be correlated significantly with whether or not cases reached court. DNA evidence proved to have the highest significance, at below the .01 level, followed by photographic evidence and then by immediacy of arrest, defined as arrest within 24 hours. In the second column, “Guilty Plea”, DNA evidence also demonstrated a highly significant relationship with guilty pleas by defendants, followed by immediacy of arrest. Two other variables showed negative relationships with pleas of guilt: fingerprint evidence and the defendant being employed. In the third column, “Guilty Result”, a guilty plea, as would be expected, was the variable most significantly related. This was followed by DNA evidence, significant below the .01 level, then by immediacy of arrest.

The overall results from the 200 cases sampled, were that 23 had no evidence to offer (NETO) in the Magistrates Courts or were finalised through a *nolle prosequi* in the higher court, resulting in 177 cases reaching court. In 30 of the 200 cases, records accessed did not indicate whether finalisation was through a plea or trial, but of the remaining 170 known, 151 were finalised with guilty pleas while 19 defendants pleaded not guilty. From the 196 of the 200 cases whose results were found in the records, there were 173 convictions (guilty pleas plus court decisions) and 23 non-convictions (court decisions, jury acquittal plus NETO/nolles). From the 173 convictions, a custodial penalty was imposed in 83 instances; although in only 78 cases did the offender spend time in prison.

For the DNA group of cases, 95 reached the courts, of which 78 were guilty pleas, leaving seventeen cases to be adjudicated. Of the non-DNA group, 82 reached court, 73 of which were guilty pleas, the remaining nine being decided before the courts. Where the guilty pleas were entered, magistrates were provided with a Police Court Brief (Form QP9) that summarised the case. However, this may not necessarily have mentioned the DNA evidence, so any effects DNA may have had would be impossible to determine conclusively. For guilty plea cases that went to the District Courts, including those that went ex-officio (a process explained on p. 174), the judge was not necessarily privy to the evidence and therefore may not have regard to it in sentencing; hence DNA could not be analysed as an independent variable.
Of the nine cases that went before the courts because of not guilty pleas, only one from the DNA group resulted in a guilty finding followed by a custodial penalty. No parallel cases at all in the control group went before the courts with the outcomes of a guilty finding and a custodial penalty. This finding, that only one sentencing decision in 100 cases could potentially be influenced by forensic DNA, led to the conclusion that the effects of DNA on sentencing decisions in property offence cases was minimal.

Despite DNA having no discernible effect on sentencing decisions, a multiple regression analysis of the 78 guilty plea cases with custodial penalties was conducted. This was to relate the penalty length to defendant and offence variables, but it did not include evidentiary independent variables such as DNA. This analysis, not shown in the Tables, found that the seriousness of the offence was the sole predictive factor in determining the length of imprisonment.

Following the bivariate analyses in Table 7.2, multivariate analyses were conducted. Table 7.3 shows the results of the logistic regression analyses for the three stages of the case reaching court, of guilty pleas and of guilty outcomes. These analyses related the independent predictor variables to the outcome stages. Logistic regression models were created using SPSS version 9.0 for Windows software. Variables found to have a significant relationship in the bivariate analyses were entered to create a full model, and then those that were not predictive were removed. In the reduced model, only the independent variables that were statistically significant below the 0.10 level were retained (Poulos, 1993: 26). By being incorporated simultaneously in the model, the variables controlled for each other’s effects.
Table 7.3: Significant Predictor Variables from Logistic Regression Analysis: Property Offences.

<table>
<thead>
<tr>
<th>Court Process</th>
<th>Predictor</th>
<th>Beta</th>
<th>Sig of Beta</th>
<th>S.E.</th>
<th>Odds ratio</th>
<th>95% C.I.</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reached court (N = 200)</td>
<td>DNA evidence</td>
<td>1.43**</td>
<td>.0068</td>
<td>0.53</td>
<td>4.17</td>
<td>1.48</td>
<td>11.73</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>1.52**</td>
<td>.0000</td>
<td>1.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>89% cases correctly classified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R² = 8.4%</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X² = 8.76**</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Guilty Plea (N = 176)</td>
<td>DNA evidence</td>
<td>1.56**</td>
<td>.0040</td>
<td>0.54</td>
<td>4.75</td>
<td>1.64</td>
<td>13.73</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fingerprints</td>
<td>-0.89</td>
<td>.1305</td>
<td>0.59</td>
<td>0.41</td>
<td>0.13</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>1.62**</td>
<td>.0000</td>
<td>0.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>88% cases correctly classified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R² = 10.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>X² = 11**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guilty outcome (N = 191)</td>
<td>Guilty plea</td>
<td>7.90</td>
<td>.0000</td>
<td>1.44</td>
<td>2699</td>
<td>161.8</td>
<td>45053</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constant (B₀)</td>
<td>-2.89</td>
<td>.0049</td>
<td>1.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>99% cases correctly classified</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Pseudo R² = 88%</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X² = 99.27.9**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p* < .05; **p < .01.

In Table 7.3, the “Predictor” column displays the independent variables that most strongly influenced the court process listed in the left column. The “Beta” column shows the logistic regression coefficient, “S.E.” is the standard error, while the “Odds ratio” is the exponentiate of the Beta value. The “Odds ratio” indicates the likelihood of a particular outcome where a designated variable is present in a case. For example, cases where incriminating DNA evidence was available were more likely to reach court: the odds being more than four times (4.17) times higher for DNA cases than for
Predicting court results

Table 7.4 gives examples to illustrate the effects of DNA evidence as a statistical predictor of the conditional probability of cases reaching court and of guilty pleas. To calculate the conditional probability for a dichotomous outcome when individual case characteristics are known, the formula used is:

\[
\text{Probability} = \frac{1}{1 + e^{-\text{logit}}}
\]

where the logit = \(B_0 + B_1X_1 + B_2X_2 + B_3X_3 + \ldots + B_kX_k\).

\(B\) is the Beta value from Table 7.3 with \(B_0\) the constant. Case examples demonstrating differences forensic DNA can make to case outcomes are shown in Table 7.4.

The addition of DNA evidence in the prosecution of property offences did not act to change the predicted outcome at any stage in the court process. For the first phase, whether cases reached court, Table 7.4 shows a probability without DNA as 0.82, while with DNA the probability increased to 0.95. This was largely because prosecutors “offered no evidence” or entered a \textit{nolle prosequi} for few property offence cases, whether or not DNA evidence was used. That is, most cases either reached court or police cautions were administered to child offenders.

As noted above, Table 7.3 indicates that where DNA evidence was available, cases were more likely to reach court. Similarly with the analysis of the effects on pleas of guilty, Table 7.3 indicated an increased probability of a guilty plea where incriminating DNA evidence was presented. For property offence cases generally, however, defendants were likely to enter a guilty plea whether or not DNA was available.
Table 7.4: Conditional Probabilities of court outcomes for various case characteristics.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Logit $B_0 + B_1 \ldots + B_i$</th>
<th>Probability $\frac{1}{1 + e^{-\text{logit}}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whether case reaches court</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 1 characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Without</em> incriminating DNA evidence</td>
<td>1.52</td>
<td>0.82</td>
</tr>
<tr>
<td><em>With</em> incriminating DNA evidence</td>
<td>2.95</td>
<td>0.95</td>
</tr>
<tr>
<td><strong>Guilty plea</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 2 characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprint evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Without</em> incriminating DNA evidence</td>
<td>0.73</td>
<td>0.67</td>
</tr>
<tr>
<td><em>With</em> incriminating DNA evidence</td>
<td>2.29</td>
<td>0.91</td>
</tr>
<tr>
<td>Case 3 characteristics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No fingerprint evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Without</em> incriminating DNA evidence</td>
<td>1.62</td>
<td>0.83</td>
</tr>
<tr>
<td><em>With</em> incriminating DNA evidence</td>
<td>3.18</td>
<td>0.96</td>
</tr>
</tbody>
</table>

**Analysis and discussion: Findings in relation to hypotheses**

**Effects on cases reaching court**

Of the 200 cases sampled, 177 or 88.5% arrived in court without a *nolle prosequi* being entered by the DPP or having no evidence presented in the Magistrates Courts. DNA evidence emerged as the sole predictor that cases would be prosecuted. This finding suggests that cases were strengthened by the presence of DNA evidence, which encouraged prosecutors to take cases to court. The addition of DNA evidence to a case increased the conditional probability of it reaching court from 0.82 to 0.95. However, most property offence cases sampled were predicted to reach court even without DNA evidence being available.
**Effects on guilty pleas**

The relationship of DNA evidence to guilty pleas is of particular interest from a cost perspective, as considerable savings of time to the courts may result if defendants opt to plead guilty and a subsequent hearing or trial becomes unnecessary. In contrast to the findings of this research in previous chapters for more serious offences against the person, DNA evidence did emerge for property offences as having a highly significant relationship with decisions by defendants to plead guilty (Tables 7.2 and 7.3).

Of 88 cases without DNA that reached court, 73 (82%) resulted in guilty pleas. This compared to 82 cases with DNA arriving in court, of which 78 (95%) were pleas of guilty. In 30 of the 200 cases, the records consulted did not indicate whether or not a guilty plea was entered. Counting juvenile cautions as guilty pleas in the analysis did not bias this finding. Although cautions administered to juveniles were counted as pleas of guilty for statistical purposes, no such cautions were included among the 100 cases in the DNA group. Only eight cautions, all in the control group, were among those sampled. As a condition of the formal caution, juveniles must admit to their guilt, so that confirmatory DNA tests were not requested from the laboratory in such cases. No juvenile offenders were included in the DNA group as a result of “cold matches”.

Although claims have been made that DNA evidence has caused more guilty pleas (for example, CrimTrac, 2003; Nearhos and Bowman 1999: 68-69), no comparative quantitative studies were cited in support of such claims. However, Dr Alaster Smith, of the UK Home Office Policing and Crime Reducing Unit advised:

> A study carried out in the UK on volume property crime suggested that offenders were more likely to plead guilty when faced with forensic evidence, including both fingerprints and DNA (Smith, 2003).
This finding, however, contrasts in part with the present Queensland-based research where fingerprint evidence demonstrated a negative association with guilty pleas for property offences. However, the relatively few cases with fingerprints in this sample, numbering only 29 of the 200 (see Table 7.1), allow that the result may be an anomaly. The fact that DNA evidence did emerge as a predictor of guilty pleas for property offences means that projected savings could be factored into cost-benefit evaluations. On the other hand, the advantages accruing may be restricted by the very limited extent that DNA evidence was found to feature overall in prosecutions for property offences. While further research is recommended to ascertain the extent of such savings, some factors having a bearing on this issue are discussed in Chapter 9.

Effects on jury verdicts

Of the 200 property offence cases sampled, only one was known to have gone before a jury in the District Court. Most property offence cases, being of a less serious nature than crimes against the person, were decided in the Magistrates Courts. Other cases proceeded ex-officio directly to the higher courts after police prosecutors had No Evidence to Offer (NETO) in the Magistrates Courts. Ex-officio is a process available under section 561 of Queensland’s Criminal Code. It is used particularly when defendants are subject to numerous charges that they prefer cleared up and dealt with, and where they wish to enter a plea of guilty and proceed directly to the District or Supreme Court. Recidivists, who can be subject to many charges, have been found to commit a large proportion of property offences (Salmelainen, 1995). One penalty is normally imposed in relation to an ex-officio guilty plea. Through the DPP, the Crown can present an ex-officio indictment in the higher court, which bypasses any committal proceeding. A sentencing discount is given for those who plead ex-officio as this saves the court and police time, because generally, a full brief of evidence does not need to be presented (Gorman, 2003; Booth, 2003).

In the one case known to have gone before a jury, the 18-year-old defendant, whose occupation was given as a professional athlete, was charged with wilful damage. This involved a broken window at a service station in the Brisbane suburb of Hamilton. The attendant alleged that the offence occurred while three persons were assaulting
him in the early hours. The complainant was unable to recall the incident clearly when interviewed by police. However, blood was swabbed from the broken window, and matched through DNA to the defendant, who denied the offence but was found guilty by a jury (Case P44; QPS CRISP; QHSS File F17046). The lack of jury cases prompted two conclusions. First, it was not possible to determine statistically any effects that DNA evidence might have had on jury decisions in property offence cases; and second, the fact that property offence cases decided by juries were very much the exception indicated that the effects of DNA on juries in such cases would not constitute a significant topic for research, compared to other offence types like sexual assaults.

*Effects on the imposition of custodial penalties*

As noted earlier, only one of 100 cases with DNA that were sampled was heard before a court and resulted in a custodial penalty. This fact alone would indicate that the effect of DNA at the sentencing stage was minimal. Of 173 convictions in the 200 cases sampled, 93 custodial penalties were imposed. The high proportion of guilty pleas, as mentioned above, largely negated any relationship between DNA evidence and sentencing decisions. This was because where guilty pleas were entered, the courts were not necessarily aware of it when pronouncing sentences.

Of the 95 DNA cases that reached court, 94 resulted in guilty outcomes, and in 60 of these cases (64%), custodial penalties were imposed. This compared with 82 non-DNA cases reaching court, where 79 had guilty outcome. Of the 79 cases, 33 cases (42%) resulting in defendants being given prison sentences. Of the total of 93 custodial penalties (60 DNA and 33 non-DNA), fifteen were suspended immediately, so that offenders served time in prison in only 78 of the cases.

As was noted above, it was not possible to ascertain whether prosecutors in the Magistrates Courts included on their court briefs the fact that incriminating DNA was available where guilty pleas were entered. Research in the United States found that, even when available, “DNA is not used by a majority of prosecutors’ offices…[and] even those prosecution offices that use DNA evidence do not use such evidence
beyond the two most serious crime types [homicide and rape]” (Tracy and Morgan, 2000: 658-9). A survey of Australian prosecutors may be warranted to determine the level of usage of DNA evidence for property offences when it is available.

**Effects of the severity of custodial penalty**

As noted above, 95% of cases with DNA and 88% of cases without culminated in pleas of guilty. This meant that in a large majority of cases the DNA evidence was never testified to in court and magistrates were only aware of it if it were mentioned on the prosecutor’s brief. In the District Courts for guilty pleas, the judge may not be aware of DNA evidence during sentencing (see p. 117). After guilty pleas, only one case with DNA remained where the evidence was heard in court and a custodial penalty resulted. No parallel cases were available in the control group. With this outcome, no statistical analysis relating DNA to length of sentence was possible. Nevertheless, the 78 guilty plea cases with custodial penalties were analysed to relate the penalty length to defendant and offence variables. It was found from a multiple regression analysis that the seriousness of the offence was found to be the sole predictive factor in determining the length of imprisonment.

**CONCLUSION**

DNA evidence was found to be collected at only a small proportion of property offence cases, the majority of these being burglaries of premises and motor vehicle thefts. A control–comparison method was used in this chapter to assess the effects of DNA evidence on property offences by statistically comparing 100 cases that used DNA evidence to 100 similar cases without, and tracking their progress through the justice process. Where prosecutors presented it, DNA demonstrated a number of effects on decisions at various stages in the court process. Cases were more likely to be brought to court by prosecutors, rather than to have no evidence offered or a *nolle prosequi* entered, and defendants were more likely to enter pleas of guilty with the courts. However, as a large majority of all property offences referred by police for prosecution arrive in court, because these involved pleas of guilty, the addition of DNA evidence to case configurations did not alter predicted outcomes. At the sentencing stage, there was no indication that DNA evidence had any influence on the
likelihood of a custodial penalty, nor was DNA found to act as a predictor of increased sentence length.
CHAPTER 8: DNA DATABASES AND EFFECTS ON VOLUME CRIME

INTRODUCTION

The principal topic of this chapter is the effects and effectiveness in police investigations of criminal DNA databases when applied to volume crimes such as burglaries. As background, the theory of how databases work is briefly outlined, after which the methods used to assess performance of the databases through secondary data are discussed. A police operation in New South Wales that used forensic science – forensic DNA and fingerprints – with the aim of reducing volume crime is then described and later analysed. Because the UK database is reputed to be the world’s most effective, a quantitative assessment of database potential is made by calculating the ratio of reported crime to convictions achieved through it for burglary offences. The strategic use of forensic-led intelligence systems (FLINTS) to maximise the productivity of links to suspects provided by the database is then discussed. Finally, the difficulties and inherent obstacles in using DNA as a long term means to reduce volume crime in relation to the behavioural characteristics of offenders, are then evaluated.

Background and hypothesis

In theory, the functioning of DNA databases relies on samples from two sources: evidence from crime scenes, and samples from arrested persons and volunteers. Once a forensic laboratory has analysed a sample, a record of the profile is stored in a central database. The profile of the sample can then be compared with every other sample on the database, and in time against incoming samples, whether these are taken from people, crime scenes or elsewhere. One feature of a database is that its utility theoretically increases as the volume of data it contains expands, and a database has to be in operation for some years, as has the national criminal database in the UK, and contain a significant proportion of the current or “habitual criminal” population, to be effective.
For this chapter it was decided to test the hypothesis that criminal DNA databases could be used to reduce levels of volume crimes such as break and enter offences (burglaries) and motor vehicle thefts. This proposition was selected as being of particular interest because DNA databases, both in Australia and the UK, were introduced and extended on the basis that they would target volume crime (Vanstone, 1998: 13-17; Blakey, 2000a: xii, 13). The CrimTrac Business Case for the Australian national DNA database factored in savings through crime reduction which, “derives from the deterrence effect as well as the intelligence information derived from the use of the national DNA system, resulting in a reduction in volume crime” (Nearhos and Bowman, 1999: 69). This application of DNA databases was, in turn, used to justify legislation that provided for extensive DNA sampling of suspects to help apprehend those responsible for volume crime offences (Green, 2000: 10).

**Method**

To assess the effectiveness of DNA databases on volume crime, it was necessary to rely on secondary data. Any evaluation based on control-comparison methods using primary data would require manipulation of the variables, a task beyond the resources of this research. As was mentioned in Chapter 1, the control-comparison method is highly regarded by many criminologists as a valuable evaluation technique, and it was favoured for that reason. The technique is also recognised as a means towards achieving evidence-based good practice in policing (Grabosky, 2003; Jones, 2003; Mazerolle, 2003).

Only one Australian study involving DNA databases that relied on this method was located. That study was the assessment of a New South Wales Police operation, code-named Vendas, conducted over seven months during 2002-03. The operation involved changes to police procedures in the use of forensic evidence – both DNA and fingerprints – to target recidivist offenders. It was conducted in three patrol areas with the aim of reducing the volume crimes of burglary and car theft. The Office of the Deputy Commissioner (Support), NSW Police, planned the operation and initiated the necessary changes (NSW Police, 2002a). The New South Wales Bureau of Crime Statistics and Research (BOCSAR) conducted the evaluation by comparing crime levels when the
operation was in progress to levels in the same months of the previous year before it commenced. The evaluation also took into account the fact that volume crimes levels had been falling throughout the State for several years, and continued to do so during the period in which the operation ran (Jones, 2003). The findings of the BOCSAR report are examined for any impact that the changes introduced may have made on volume crime levels.

Further data for this chapter were derived from commentaries on, and studies of, the UK national criminal DNA database, which is claimed to be the world’s most successful (Blakey, 2000a: 13). Most relevant to the present research were the 2002-03 Annual Report of the UK’s Forensic Science Service, and studies by Blakey (2000a), Speakman (1999), Gaule (1999), all of which were reviewed in Chapter 3. A Home Office report on the UK’s DNA Expansion Programme was completed in 2002, but this has remained confidential (Burrows, 2002). The UK’s DNA Expansion Programme was mentioned in Chapter 1, and involves the committing of £208 million over the period 2000-04 towards recording the profiles of the entire UK criminal population, estimated at around 3.5 million individuals.

A number of other published articles were found to provide quantitative information about the UK DNA database (for example, Gunn, 2002:9; Napper, 2000: 67; Dovaston, 1996: 20). However, these were by nature more commentaries than criminological studies, in that they were not capable of producing negative findings. These commentaries relied largely on numbers of laboratory database matches, links or “hits”, to support a case for the effectiveness of the DNA database. As Ben Saul, a Legal Officer with the Australian Law Reform Commission has pointed out:

Statistics on the number of matches between DNA profiles and crime scene stains are, however, misleading in some crucial respects. Firstly, “matches” do not signify guilt, nor do they represent arrests made or convictions secured. A match simply means that a particular person may
have been, but was not necessarily, present at a particular crime scene at some point in time (Saul, 2001: 93).

A more accurate measure of effectiveness than match numbers is the number of matches or “hits” that culminate in convictions compared to numbers of reported crimes. This ratio is more meaningful as it relates the levels of crime in the community to the justice process goal of achieving convictions. It can therefore be regarded as superior to the Australian measure of “cleared offences” as defined in Appendix A. According to one study on police performance measurement, “making an arrest is one thing; making an arrest that will result in an indictment and conviction is something else entirely. In some senses a better measure of arrest productivity is the ratio of arrests resulting in convictions to crimes known to the police” (Skogan and Antunes, 1979: 248).

No structured criminological studies from the UK were located to confirm the proposition that the UK DNA database was responsible for reducing volume crime. However, the 2003-04 Annual Report of the UK’s Forensic Science Service noted how, “a burglary reduction initiative within the West Midlands saw crimes reduce by 10% compared to a national average increase of 1%” (FSS, 2004: 11). Figures from the West Midlands Police Annual Review for 2003-04, however, differed from those of the FSS. The Review stated “with the help of Operation Safer Homes, last year burglaries reduced by six percent from 56,542 to 53,108, while house burglaries fell from 26,956 to 26,633, a reduction of 323 offences” (West Midlands Police, 2004: 6), that is, a drop in the latter of 2.5%. Vehicle crime in the West Midlands was reduced by six percent in the same year through Operation Safer Motors (West Midlands Police, 2004: 6).

Burglary reduction initiatives have been implemented with varying degrees of success in the UK since at least the mid-1980s (Allat, 1984: 99-116; Brantingham and Brantingham, 1985; Bennett and Durie, 1999). Many rely on proactive policing as well as on “reactive” techniques that include DNA (see Coupe and Griffiths, 1996; Bowers, Johnson and Hirschfield, 2003; Jacobson, Maitland and Hough, 2003). At least two issues have been associated with burglary reduction initiatives. The first is the displacement effect,
where a crime reduction in one area is believed to be accompanied by a corresponding crime increase in adjacent areas as criminals move their operations geographically (Eck, 1993: 527-526). However, an Australian empirical study of a burglary reduction operation found little evidence to support the concept of displacement (Ratcliffe, 2002). A second issue arises from the behavioural characteristics of burglars, as many have been found to increase their criminal activities following imprisonment. This can make the achievement of long-term reductions more difficult, a situation that is discussed later in this chapter.

Information on the degree to which DNA contributed to this reported reduction was not available at the conclusion of the present research, but the Forensic-led Intelligence System (FLINTS) developed by the West Midlands Police is discussed later in this chapter. Another study, the UK “Pathfinder” project, which examined results from increased forensic activity in two regions, found that higher attendance rates at crime scenes did not necessarily lead to crime reduction (Burrows, Tarling, Mackie, Poole and Hodgson, 2002: 17). In the absence of information about impacts on crime levels, this research calculated the ratio of convictions achieved through DNA in the UK, to numbers of reported crimes based on data from the studies mentioned above as an alternative measure.

**Australian research: Operation Vendas**

The police operation code-named Vendas was run in three of the 80 New South Wales Local Area Commands (LACs) or patrol areas for seven months from July 2002 until January 2003. It involved more than 500 police officers and a large number of civilian staff from Forensic Services and other areas. By targeting repeat offenders, Vendas aimed to further reduce the levels of volume crimes like burglaries and car thefts in the three patrol areas against a background of falling volume crime rates in the State overall. The Mission Statement in the User Information Pack conveyed the operation’s main thrust:
To aim for 100 per cent attendance to Break and Enter (attempted and actual) and Recovered Stolen Motor Vehicle crime scenes by SOCOs [Scenes of Crime Officers], this will lead to the identification, investigation and arrest of the recidivist offenders…(NSW Police 2002b: 1).

Other key components and improvements implemented for the operation were:

- A police assistance line (PAL) for direct generation of crime scene attendance requests by crime victims, rather than requests being relayed through general duties police;
- Prioritising the processing of DNA samples and fingerprints to achieve identifications and dissemination of results within seven days for DNA and two days for fingerprints;
- Having dedicated crime management units to prioritise both intelligence linking and the investigation and apprehension of identified suspects (Spence, Cushway and White, 2003: 26-28).

The operation relied on the premise that a large proportion of volume crime was committed by a small core of repeat offenders. Anecdotal evidence from police suggests that around 20% of offenders are responsible for about 80% of crime committed (Blakey, 2000a: xiv). Academic studies have provided some support to this proposition, one finding that 20% of active offenders commit 75% of crimes in some areas (Salmelainen, 1995: 24). A further principle the operation relied on was that, in the absence of witnesses to many of these offences, forensic evidence in the form of DNA and fingerprints was the most resource efficient method of identifying recidivists (New South Wales Police, 2002a). In addition to incapacitation from arrests where bail was denied and from incarcerations, the operation was intended to benefit from deterrent effects flowing from any increases in convictions.
During the operation, 111 crime scene samples were submitted for DNA testing, from which 82 DNA profiles (74%) were obtained. Thirty of the 82 profiles (37%) were identified against the DNA database of around 15,000 individuals (New South Wales Police, 2003). Although the national DNA database did not become operational until March 2003, Australian States by then had built up regional databases. The additional systems (in dot points above) were implemented to maximise results from the forensic sciences. This approach was a remedial solution to Blakey’s finding in the UK (2000a: x), and the pre-Vendas position in NSW, that many intelligence generated DNA and fingerprint identifications disappeared in to a “black hole” and were never followed through.

The BOCSAR evaluation report, in comparing crime levels during the operation with those prior to it, stated:

…there was no indication that the volume of BES [break, enter and steal] or MVT [motor vehicle theft] offences decreased in any of the LACs as a consequence of Vendas. Nor did the analyses reveal any increase in the rate of arrest for these types of crimes in any of the LACs (Jones and Weatherburn, 2004: vii).

Hence, even when combined with the larger contribution from fingerprint science, whose national Automated Fingerprint Identification System (AFIS) database has been operating since 1987, forensic DNA was not able to achieve a reduction in volume crime in any of the three patrol areas. Importantly, the BOCSAR report analysed reasons for Vendas failing to achieve its goals:

The lack of impact on the arrest rates occurred primarily because the operation did not increase identification rates by enough to produce measurable changes in arrest rates…The lack of substantial impact on identification rates was caused by the fact that there were only modest increases in the collection of fingerprints [and presumably DNA] from
crime scenes at the trial LACs … This was despite the fact that there was a marked increase in attendance rates at RSMV [recovered stolen motor vehicles] crime scenes (Jones and Weatherburn, 2004: vii-viii).

These, and other issues arising from the operation, are explored in the discussion section below.

**The UK database**

As mentioned in Chapter 2, the United Kingdom began operation of the world’s first national criminal DNA database in 1995, and according to Blakey, “This is a substantial success story, and one in which this country has led the world” (2000a: 13). Outcomes from the reputed world leader in DNA databases were examined. The method selected for the present research was to calculate a ratio or percentage of convictions to reported volume crime, achieved through the UK database, using figures published between 2000 and 2003. The results can provide a measure of outcomes being achieved eight years after the database had commenced operations. They also provide a series of stages that may be examined to find where key changes could be targeted to improve outcomes.

In order to calculate the percentage of convictions to reported crime achieved through DNA, a model was constructed that traced the attrition of case numbers through a series of steps:

- First, the percentage of reported crime scenes attended by Scenes of Crime Officers (SOCOs) was taken;
- This was reduced by the percentage of crime scenes at which DNA was recovered;
- This was further reduced by the percentage of crime scenes that resulted in a detection of a suspect following a laboratory match;
• The above result was increased by the value of the “multiplier”, that is, the increase from any additional charges laid by police that flowed from the initial match;
• Last, the detections achieved were reduced by the percentage that resulted in convictions.

For several reasons the model is not capable of measuring, nor is it designed to indicate, effects on crime levels. One reason is that crime levels may be subject to influences entirely outside the model. An example of this is target hardening reducing car theft after vehicle manufacturers build more anti-theft features into their products. Convictions also do not necessarily indicate whether an offender has been incapacitated through imprisonment or been reformed by the justice process. If free, they may continue to offend, thereby maintaining or increasing crime levels. Of relevance here is the fact that in both New South Wales and the UK it was found that only about one quarter of convicted burglars were imprisoned (Weatherburn and Grabosky, 1997: 7; FSS, 2003: 26).

The collection rate for DNA is limited both by the percentage of crime scenes attended by Scenes of Crime Officers (SOCOs), and by the percentage of scenes where trace evidence is recovered. For the first stage in the model, the national attendance rate by SOCOs of the various police forces in the UK to examine burglaries of dwellings for DNA and other evidence was found by Blakey to average 75%, with the best attendance rate among over 40 police forces at 84%. For the second stage, Blakey found the percentage of UK crime scenes attended where samples were recovered for DNA testing averaged three percent nationally, with a maximum of 4.9% reached by some police forces (Blakey, 2000a: 18-21).

Despite major increases in the number of DNA scene samples submitted over the following year as a result of increased funding, the yield figure of three percent remained constant and was confirmed by the 2001 DNA Expansion Program: Evaluation Report (quoted in Victorian Parliament Law Reform Committee (VLRC), 2001: 474. Note: The
Evaluation Report was supplied in confidence for the present research and therefore cannot be quoted directly). The UK figures coincided closely too with the recovery level in New Zealand, where the national average of DNA submissions from burglary offences was found to be three percent (Walsh, Moss, Kliem and Vintiner, 2002: 212). That is, international studies agreed that DNA was available in three to five percent of reported burglaries.

The 2002-03 Annual Report of the UK’s Forensic Science Service provided further figures about the productivity from DNA found at volume crime scenes. The UK term “detection” equates approximately to the term “clearance” in Queensland as defined in Appendix A:

For domestic burglary, the detection rate increased from 14% to 44% when DNA was available. Each crime detected with DNA led to 0.8 other crimes being detected and the Home Office estimated that some 50% of detections led to convictions, 25% of these led to custodial sentences and each custodial sentence prevented a further 7.8 crimes being committed (FSS, 2003: 26).

The third stage in the model follows from the three to five percent of reported burglaries, “when DNA was available”. The FSS reported that in those three to five percent of cases the rate for the detection of offenders achieved through DNA was 44%.

For the fourth stage in the model, following these detections (or cleared offences), a further 0.8 crimes on average were cleared. This occurred because of the so-called “multiplier effect” that operates through the intelligence process and may lead to additional clearances. An example is where a number of adjacent houses, shops or offices have been burgled at the one time. If a DNA link is achieved from one scene, a suspect may then be charged with the additional offences on the basis that he or she was complicit in them. Alternatively, police interviews with suspects can elicit confessions to further offences or the nomination of co-offenders. Where DNA and fingerprints are
integrated into an intelligence system, searches of latent fingerprints from areas in which offenders are known from DNA to operate, can produce further detections or clearances (Wise, 2003a: 14). In the present model, because 0.8 additional crimes are cleared, the value of the multiplier would be 1.8 – that is, for each crime cleared through DNA, a total of 1.8 (or 180%) clearances on average would result.

For the final stage of the model, the FSS reported that half of the detections led to convictions. A “best case” model based on these figures for burglaries would therefore show:

- Burglaries attended by Scenes of Crime Officers: 85% of those reported
- Burglaries from which DNA was recovered: 5% of those attended
- Detections achieved (i.e. offences cleared): 44% where DNA available
- Total detections with multiplier: 180% of initial detections
- Convictions rate achieved from detections: 50% of total detections

The cumulative result can be calculated by combining the successive attrition rates from different stages, that is, by multiplying the percentages in number form: \((0.85 \times 0.5 \times 0.44 \times 1.8 \times 0.5 = 0.01683\) or 0.017 approximately). This means that by 2002-03, the world’s leading DNA database was instrumental in achieving convictions in less than 2% (or 0.017) of reported burglary cases in a “best case” scenario. If the average attendance figures of 75% attendance rate and 3% yield found by Blakey (2000: 18-21) are used in the calculation, the result drops to 0.0089, or a ratio of convictions through DNA to reported burglaries of less than 1%. Displaying the attrition of cases for the “best case” model in an alternative format rounded to whole numbers shows:

Of 100 reported burglaries,
- 85 would be examined for DNA,
- 4 DNA samples would be collected for analysis,
- 2 samples would lead to the detection of suspects,
- 3 detections would result with the multiplier,
- 1 or 2 convictions would result.
As only one quarter of these convictions resulted in custodial penalties, the incapacitation effect of imprisonment from being identified through DNA would apply in less than one half of one percent of reported offences. This estimate was supported by an analysis of primary UK data published in late 2004, which found that in one year, DNA provided 24,917 identifications from 1.8 million volume crimes, that is, 1.4% (Burrows and Tarling, 2004: 220). Based on figures from the ACPO and the FSS, it is therefore concluded that the effects of the database on achieving convictions and imprisonment of offenders is very marginal. This confirms the opinion by Freckelton and Selby that, “DNA profiling has the potential to have an impact upon arrest and conviction rates, but it will not be statistically dramatic” (2002: 488). The magnitude of any specific or general deterrence arising from the imprisonments may be correspondingly very low.

Although these estimates apply only to burglaries, results from other types of property crime, such as recovered stolen property, robberies, wilful damage and arson are considerably lower, primarily due to lower recovery rates from the scenes or exhibits involved. The ratio of 0.01683 convictions to reported crimes calculated above is an improvement on the ratio of 0.0095 calculated in this research from data in studies conducted by Speakman (1999: 4-5) and Blakey (2000a: 18-21) some years earlier. One reason for this improvement, and for the reported reduction of burglary levels in the West Midlands, is the introduction of forensics results management programs such as FLINTS – the Forensic-led Intelligence System.

Forensic-led intelligence

In recent years, the UK’s national criminal DNA database is well known to have consistently achieved hundreds of “cold hits” per week. As the initial report by David Blakey observed, the challenge for police is to transform these “hits” into convictions or into lowered crime levels through maximising the productivity of the intelligence generated (2000a: xii). Leary and Bailey too have pointed out, “our ability to manage our intelligence resources to maximise our legitimate advantage in this ‘battle’ [to gain an information edge] will govern how effective we are in tackling crime” (Leary and Bailey, 2003: 1).
One system that began implementation in 1998 in the form of a software program has been variously termed Forensic-led or Force Linked Intelligence System (FLINTS). The West Midlands Police covers the UK’s second largest city, Birmingham, home to the major FSS forensic biology laboratory, and that force has been at the forefront of implementing this concept (Blakey, 2000a: 51-2). The FLINTS program integrates information from a variety of sources, and links people (suspects), events (crimes), locations (crime scenes), times and evidence types (DNA, fingerprints, footprints, and so on). The software package includes an embedded Geographical Information System (GIS) capability that reflects a growing interest in the geo-spatial features of crime, and updating can take place within four minutes of the receipt of information. Nick Tofiluk, Assistant Chief Constable (Intelligence) of the West Midlands Police, has explained:

The Police Service is expert at collecting information from forensic sources, (footprints to fingerprints and DNA), prisoners, crime and other records we keep on a daily basis – but the more information we collect, the harder it has become to use it effectively in providing a comprehensive intelligence picture (Tofiluk, 2003a: 23).

The breaking down of “information silos” in the forensic intelligence process has been addressed in theoretical and practical research conducted at the Institut de Police Scientifique et De Criminology at the University of Lausanne, Switzerland (Ribaux and Margot 2003: 135-143; Ribaux, Girod, Walsh, Margot, Mizrahi, and Clivaz, 2003: 47-60). However, as a simple example of FLINTS usage, crimes at which a particular suspect’s DNA or fingerprints have been identified can be displayed on a street map on a computer screen. Types and times of crimes can also be mapped or graphed, and known links among offenders can be plotted. The system therefore allows crime clusters, or “hot spots”, and likely times for offences to occur, to be identified. Patrols can then be routed or stepped up to these areas at appropriate times. An emphasis in FLINTS is on provision of information to police on the street, and the system is capable of transmitting images of wanted offenders to patrolling officers’ mobile telephone screens (Ratcliffe, 2004: 5-23; Tofiluk, 2003a: 23).
A prominent feature of FLINTS has been the targeting of key criminals. The constructing of links among offenders whose DNA or fingerprints have been found at the same crime scene, or who have been arrested together, has allowed visual patterns of criminal networks to be constructed. These network structures contrast with the hierarchical arrangement of policing organisations, while study of the networks among offenders has revealed, “the nature of criminal behaviour is more complex, more dynamic and more diverse than we have hitherto considered” (Leary, 2002: 2).

Networks have been found highly adaptable to changing environments, and operate extremely efficiently due to their ability to facilitate fluid communications. By using FLINTS to identify “hubs”, or centres of communications and activity in the networks, key players can be targeted, arrested and removed. This strategy has a far greater impact on crime levels than merely arresting active criminals at random (Leary, 2002: 4-5). Tofiluk states, “discovering these links has resulted in thousands of hours saved in the management of forensic intelligence … resulting in hundreds of crimes being solved and criminals convicted” (2003a: 23).

With its ability to link crimes, police interviews of suspects need not be limited to instances of single crimes. Confronted with a file of crimes and associates linked though DNA and fingerprint evidence, suspects can be questioned not only about particular offences, but about how many other crimes they have committed (Leary, 2002: 3-4). FLINTS also has the advantage of utilising “soft” as well as “hard” intelligence; that is, partial DNA and partial fingerprint matches that are insufficient as court evidence can be entered as data (Tofiluk, 2003; see also Riaux, Girod et al., 2003: 51-52). A series of matches may be of use to police during interviews of suspects to produce admissions to multiple offences. Alternatively, one of the two forensic identification methods used can generate suspects whose further trace evidence, if also found at the crime scene, can be compared via the other science, which may then result in evidence of a court standard. This practice of cross-comparison is followed elsewhere in the UK (Rice, 2003) as well as in Australia (Wise, 2003a: 14).
The FLINTS software was offered *gratis* to Australian police organisations in October 2003 (Flogel, 2004). However, in the same month in Queensland instead, following the recommendations of the CMC report (2002) which examined the Button appeal and concentrated on the use of DNA evidence in the courts, the QPS began the operation of a Forensic Register. This program is detailed and comprehensive, and therefore time-intensive for staff, and was designed to track forensic exhibits among the various forensics areas and through the departments of Health, Police and Justice. Unlike FLINTS, the register was not intended as a proactive intelligence tool, and is primarily a recording and management information instrument. An outline of the FLINTS concept is included in this dissertation as Appendix B.

A DNA Intelligence Project has been initiated as a collaborative project between forensic and law enforcement organizations in New Zealand, where a national DNA database commenced operation in 1996. Case file data have been collated to identify trends such as the level of use of DNA by police in investigations, the relative success of different types of crime scene samples and the geographical distribution of crimes. That system too includes a GIS mapping capability that allows analysis of relationships between localities, and can link offenders to crimes outside their residential jurisdiction (Walsh et al., 2002). These projects in the UK and New Zealand can be contrasted with reported outcomes from DNA databases in New York and Oregon.

**DNA databases in the United States**

The only published quantitative study found that related DNA databases to overall crime levels and the justice process in the United States was by Tracy and Morgan (2000), which was reviewed in Chapter 3. That research examined in detail US crime statistics and database costs to assess crime effectiveness and cost effectiveness. The authors concluded that with volume or property offences, biological trace evidence would not be left at enough crime scenes to lead to a substantial improvement in conviction rates; and that a high proportion of serious offences were already solved by police, so that DNA
databases would make only a very marginal difference. Additionally they calculated the costs for establishing and maintaining extensive DNA databases were “astronomical” (Tracy and Morgan: 2000: 686-8), thereby reasoning that the databases would not be cost-effective.

Their results would appear confirmed when juxtaposed with excerpts posted by Judge Peter McQuillan (2003) on an innocence project website in the US:

In 2001, New York sought to ascertain the dispositions of its first 102 cold hits [Gilmer and van Alstyne, 2002]. The inquiry found that only four hits resulted in convictions; and in 14 others, charges were pending. The researchers were chagrined to find that in two-thirds of the hits, there was no record of what had become of the cases. “The lack of records concerning DNA’s impact on convictions is a major problem,” says one expert. “How can you go to legislators and ask for more money for something in which you can’t even demonstrate real results? We ought to be answering that question first” (USA Today Oct. 7, 2002 [Willing, 2002: A01]). But thanks to a newspaper’s investigation, we know what happened to some cold hits in Oregon between 2000 and 2002. During those years, the Oregon State Police Crime Lab analysed DNA evidence from 86 burglaries in Portland. There were 33 cold hits and the relevant information on these hits was sent to the Portland Police Bureau. But the reports rarely made it to the investigators for follow-up action. Why? It seems that because detectives were not routinely assigned to property crime cases, the hit notices went to the patrol officer who responded to the burglary complaint many months earlier but who now assumed that others were pursuing the lead. “Utilizing DNA for property crime cases is brand new for us”, explained a Portland police official, “That’s why there’s so many kinks in the process” (The Oregonian Nov 14, 2002: 1).
The 7th October 2002 cover story in USA Today revealed that DNA evidence often remained unanalysed as newer cases and cost concerns took priority. Four States – Virginia, New York, Illinois and Florida – which had spent aggressively to build DNA databases and contribute to the federal system, accounted for 56% of the 5,436 matches made by the national database since 1992. Thirteen States were credited with no matches at all during August 2002 (Willing, 2002: A01). It is apparent that dedicated result management strategies and use of forensic intelligence systems to maximise benefits from DNA identifications were yet to be introduced in most of these jurisdictions.

Analysis and discussion

As no published studies were found that conclusively singled out DNA databases as being responsible for lowering volume crime levels, the hypothesis at the beginning of this chapter should be regarded as so far unproven. For Operation Vendas, a critical analysis of the research methods used, the strategies devised, the planning and the processes applied in their implementation may assist in identifying the reasons that forensic DNA was not successful in reducing volume crime. To improve the monitoring of future such operations as Vendas, the BOCSAR report recommended first, that time periods greater than a few months be used for such evaluations. Second, clear demarcations should exist between when the new strategies are being applied and when they are not. Third, the new strategy should be evaluated in sites where the type of crime is prevalent, but not in areas where the strategy is already being pursued, even in an elementary form (Jones, 2003; Jones and Weatherburn, 2004: 31, 33).

The BOCSAR report also examined the assumptions on which the Vendas strategy was founded. Rather than aim at a 100% attendance rate at crime scenes, it suggested that beyond a certain level of attendance there was a point of diminishing returns (Jones and Weatherburn, 2004: 32). This assessment agreed with that of Blakey (2000a: 18-20), who recommended from experience in the UK that attendance levels should take into account the geography of the area, its level of crime and available resources. Discretion might also be applied in the selection of crimes to attend based on seriousness and likely productivity: for example, a garden shed broken into during heavy rain (which tends to
wash away forensic evidence), and where nothing had been stolen, would be low on the list of attendance priorities (Brand, 2003). Model procedures as a guide to good practice already exist for UK police and SOCOs, and are contained in a *DNA Manual* published by the Association of Chief Police Officers (ACPO, 2004: *Jane’s Police Review*, 2004b: 1).

Complex police operations require detailed planning, and an approach that could prove useful is the Program Evaluation Review Technique (PERT) which was developed to reduce the time and cost for projects. This technique might assist to pre-empt implementation problems experienced during Vendas by modelling as a network tasks that can be performed sequentially or in parallel. Problems with Vendas included a lack of experienced investigators in one area, insufficient supplies of digital cameras for photographing fingerprints in another and problems with the measurement of DNA identifications over time (Jones and Weatherburn, 2004: 33; Stoner, Yetton, Craig and Johnston, 1994).

Other flaws that were identified in the implementation of Vendas included much longer turnaround times than planned for DNA identifications. Rather than the seven days minimum anticipated, a median time of 37 days was taken in one patrol area and 34 days in another. Martin Gaule’s study, reviewed in Chapter 3, emphasised the positive relationship between timeliness and productivity in the processing of DNA evidence. In the Vendas case, the time lag was attributed to under-resourcing of the forensic laboratory and subsequent backlogs (Jones and Weatherburn, 2004: 29). Such backlogs are not uncommon elsewhere, and this issue is discussed in Chapter 11. A further problem that arose during Vendas was that, several months into the operation, court commitments intruded on the time available to investigators. This situation arose due to cases commenced earlier in the operation being prosecuted. Fulfilling these court duties acted to reduce time for further Vendas-related investigations, which acted to diminish outcomes (Spence, Cushway and White, 2003: 26-28).
The report on Vendas outlined the causal chain through which the strategy on attending all volume crime scenes was intended to work:

(a) By increasing the volume of evidence collected;
(b) An increase in identification numbers should follow;
(c) The numbers of arrests should increase as a result;
(d) Increased successful prosecutions should follow (Jones and Weatherburn, 2004: 32-33).

While some of these increases were achieved in some patrol areas, they were of insufficient magnitude to produce the desired outcomes. Future operations would therefore need to concentrate on removing any impediments to attaining (a) through to (d).

As mentioned in the Methods section above, Operation Vendas was the only control-comparison evaluation located that assessed the potential of DNA to contribute towards reducing such volume or property offences. Generally, senior police have favoured strategies that produce arrests over implementing policies that reduce crime. Weatherburn and Grabosky have explained:

It is arguable that the police are only rarely focussed single-mindedly on the task of reducing crime. There are several factors underlying the problem, the most important of them is that many police, even at the most senior levels, have not yet come to grips with the fact that there is often an inherent tension between strategies which are effective in controlling (or preventing) crime and strategies which are effective in apprehending or convicting offenders. Secondly, it is much easier to devise operations which raise arrest and clear-up rates than it is to devise operations which reduce crime. Most sections of the media can also be relied upon to judge police operations as successful if they boost arrest and clear-up rates regardless of whether they exert any effect on crime. Thirdly, the police,
like many others involved in the development and implementation of public policy, are often less than rigorous and objective in evaluating its effects.

The failure to appreciate the tension between strategies effective in apprehending offenders and strategies effective in reducing crime stems from the widespread assumption that the path to lower property crime is through more arrests and tougher penalties (Weatherburn and Grabosky 1999: 91).

This might explain not only the scarcity of studies that focussed on DNA and crime reductions, but also the publicising of the impressive sounding DNA database “match numbers” and “hit numbers per week”, rather than more meaningful measures like crime reductions achieved, or ratio of convictions achieved to reported crimes.

In the UK, it was calculated above that by 2003 convictions were being achieved in less than two percent of reported burglaries through the DNA database. The Victorian Parliament Law Reform Committee remarked on the scarcity of studies and documentation on outcomes from UK DNA crime scene evidence, commenting. “There is therefore some doubt as to whether the investment in the collection of DNA from volume crime is being repaid in terms of the resulting prosecutions and convictions” (VPLRC, 2004: 474). Additionally, in examining issues of benefits-costs, the VPLRC noted, “Fingerprinting is cheaper and generally faster than DNA profiling” (2004: 475). It also quoted the UK’s Home Office DNA Evaluation Report, which observed that in comparison to DNA, “fingerprint identifications appear to have yielded a far higher number of additional detections” (Smith, 2001: 78 quoted in VPLRC, 2004: 474). A later UK study found from primary data that of 1.8 million volume crimes committed annually in the UK 42,840 identifications in one year were credited to fingerprints versus 16,104 to standard DNA profiling (Burrows and Tarling, 2004: 220). However, from a police and forensic intelligence perspective, DNA and fingerprints are complementary forensic tools (Wise, 2003b).
The modelling of the ratio of convictions achieved to reported crime in the UK is now examined with the aim of identifying any points at which interventions might improve outcomes. For the first stage in the model, the attendance rate at crime scenes, a review could be conducted of the work practices of the most productive SOCOs with a view to emulating it elsewhere. An emphasis on quality rather than quantity of forensic evidence gathered may improve productivity. In the second stage, the recovery rate of trace DNA from volume crime scenes, from available data, has been shown to have a ceiling at around 5%.

The third stage in the model is the laboratory match rate, and the Leeds-West Yorkshire area achieved the highest value encountered for this, at 67% (FSS, 2004: 11). Match rates for volume crime can be increased, not so much by enlarging absolute numbers of offender reference samples on the database, but by sampling offenders at the earliest opportunity. This is because there is a fast-changing population or turnover of the active offender population (Leary and Pease, 2002: 3). In Australia in 1997, the burglar population was estimated at close to 30,000 (Prenzler and Townsley, 1998: 300). Around 80% of burglars in Western nations have been found to be young males aged 15 to 25, and in Queensland in 2001-02, “91% of burglary offenders were male and 69% were males aged under twenty-five years” (QPS, 2002: 1). Criminal careers are typically short, and each year several thousand of these youths in Australia outgrow committing burglary offences and “retire”, thereby rendering obsolete any DNA database profiles. The ranks are replenished annually by thousands of new faces whose DNA profiles are not recorded for comparison purposes. Applying this information to DNA sampling, UK researchers have recommended:

This emphasises the importance of taking criminal justice [that is, reference samples] at the first available opportunity, perhaps at a time of official caution. It highlights the need to remain realistic over the shortness of time for which most criminal justice samples will be relevant for crime detection purposes. The usefulness of NDNADB [the national DNA database] does not necessarily increase with its size, but with the
proportion of those recently identified as offenders who are included (Leary and Pease, 2002: 3).

The final stages in the model of reported offences to convictions are the arrest and conviction rates achieved from laboratory matches. Systems like FLINTS address the earlier of these two stages, which is the one most amenable to improvements by police administrators through dedicated results management, intelligence and investigations and prosecutions sections. Crime level reductions, if any, while not included in the model above, might result from the convictions or imprisonments achieved, provided that the levels achieved were sufficiently high. If so, such an outcome would rely heavily on the assumption that a small proportion of burglars are repeat offenders responsible for a high percentage of crimes. Further quantitative research on this assumption, including to what degree and in which locations it applies, is therefore crucial for the planning of future operations and to gauge potential impact of forensic science on crime levels.

As noted earlier, it is known from one Australian study that 20% of offenders might be responsible for 75% of burglaries in some areas (Salmelainen, 1995:24). Research in New South Wales revealed, “the majority of offences (86%) for which juveniles appear and re-appear … are property offences and not crimes of violence” (Cain, 1997: 3). As noted above, forensic evidence from crime scenes can identify offenders at only a very small percentage of cases. However, repeat offending by a particular person would increase the chances of their trace DNA eventually being found and, if they were recorded, being identified. The counter-argument to this is that those who have only a fleeting contact with the justice process commit a very large amount of property crime. A New South Wales study found,

Around 70% of juvenile offenders had one, and only one, proven appearance in the Children’s Court. A further 15% had just two proven appearances. That is, 85% of juvenile offenders had reasonably limited involvement with the criminal justice system (Cain 1997: 3).
Nearly all of these irregular offenders are unlikely to be identified through DNA.

Many burglars are never caught, so their DNA will never be sampled. Among a cohort of 105 practising burglars interviewed and studied by Wright and Decker in the US, 44 (42%) were found to have had no burglary arrests, 35 (33%) had been arrested for burglary but had no convictions, while only 26, or 25%, had been convicted for burglary (Wright and Decker, 1994: 12). In most jurisdictions, only the 25% convicted would have their profiles retained on a database, unless they had been convicted for other recordable offences. Similar research on this issue among practising burglars in Australia would be informative about the proportion of offences committed by unrecorded novices versus by offenders who have been sampled.

A number of studies have been conducted on offender behaviour in relation to the principles of deterrence and incarceration. Wright and Decker found that although they do fear being caught, burglars correctly estimate the chances of this happening as extremely low. In NSW in the 1990s, police made arrests in around only five percent of burglary cases each year and about two thirds of the defendants were convicted. As noted earlier, about one quarter of those convicted were imprisoned (Weatherburn and Grabosky, 1997: 7). Fear of apprehension was found merely to enhance burglars’ thoroughness in target surveillance or to cause them to use alcohol or drugs to overcome inhibitions. Further, burglars who had been caught were not deterred and did not expect to be caught again (Wright and Decker, 1994: 127-133; see also “Deterrence and forensic DNA” in Chapter 9).

The long-term impact, if any, of the DNA database on the present low conviction rates for burglary, with an even smaller proportion of offenders being imprisoned, is yet to be assessed. Of those burglars who are jailed, one study found they quickly made up for lost time by following their release with a burglary “spree”, so that their overall offence rate quickly equalled what it would have been had they not been incarcerated (Hurrell, 1993). Another study has shown imprisonment to be positively correlated to burglaries (Gray, 1994), a relationship that might be explained by social learning theory (Akers, 1990). On
the issue of deterrence, Weatherburn and Grabosky have noted how “the Sentencing Act [1989] in New South Wales … increased average prison terms by a third but produced no demonstrable effect on crime” (1999: 82). Thus, while the database may increase arrest numbers in the short run, its long-term impact has yet to be ascertained, as this may relate to the workings of the justice process, and be limited by the behavioural characteristics of offenders.

Jones and Weatherburn have summarised a number of factors that impact on the utility of forensic evidence in controlling crime:

The potential value of forensic evidence in controlling any particular form of crime depends on a host of other factors; such as the relative contribution of repeat versus novice offenders to the crime rate, the speed with which forensic evidence can be processed, and the ease and speed with which suspected offenders can be apprehended, the rate at which they are successfully prosecuted and the deterrent or incapacitation value of any punishment imposed by the courts (Jones and Weatherburn, 2004: 32).

While operation Vendas may not have achieved its goal, and the “best case” conviction rate from DNA databases in the UK was below two percent, neither Vendas nor criminal DNA databases should be devalued, nor their worth underestimated. Attendance at and forensic examination of crime scenes increases victim satisfaction and reduces fear of crime, which of themselves are important outcomes (Jones and Weatherburn, 2004: 35). Undoubtedly, DNA databases also assist in bringing more offenders to court, while the presence of some crime prevention value can be gauged by the estimate in the UK that each custodial sentence prevented a further 7.8 crimes from being committed (FSS, 2003: 26).

As was noted in Chapter 6, reported numbers for most property offences in Queensland have been declining since around 2000. Figures showed an overall decrease for 2002-03
of 7% on the previous year when allowing for population growth – a decline that reflects the position in most other Australian States (AIC, 2003c: 39-40) and of crime in many Western countries (see for example, Mayhew, 2002; Blumstein and Wallman, 2000). This is no reason for complacency, as crime rates in Australia are still very high. An International Crime Victim Survey has shown that Australia rates among the worst of 17 industrialised countries, with up to 30% of the population as crime victims each year (van Kesteren, Mayhew and Nieuwberta, 2000). While the decline in volume offences is already occurring independently of DNA use in Australia, further reductions may need to rely on a combination of forensic science, burglary reduction initiatives and situational interventions like target hardening aided by key social strategies as proposed by Lauchs and Romeo (2002).

CONCLUSION

This chapter examined the effects of DNA databases on property crimes, particularly burglaries and car thefts. No published studies using recognised criminological methods were located that would indicate DNA databases were directly instrumental in lowering property crime levels. Results to date from an independent evaluation of one police operation in New South Wales concluded that increased application of forensic DNA and databases made no impact on reducing property crimes. In the UK, eight years after commencement of a national criminal DNA database that is reputed to lead the world, the conviction rate achieved from reported burglaries was, on average, close to one percent, with only a quarter of these convictions leading to imprisonment. It was therefore concluded that the effects of the UK database on convictions for volume crime through incapacitation was very marginal. Nonetheless, improved strategies for obtaining DNA evidence in burglary cases, and for integrating the results with information from other sources such as fingerprints, along with the use of non-forensic burglary reduction initiatives, might accomplish reduced crime levels. This would rely, in part, on the improved apprehension of high-volume repeat offenders. The Forensic-led Intelligence System (FLINTS) developed by the UK’s West Midlands Police to maximise results from DNA matches, and used in conjunction with such Operations as Safer Homes and Safer Motors, is a successful example of such a program. Without results management
strategies, DNA laboratory matches have been shown in the US, the UK and New South Wales, to disappear into a “black hole”. Long-term volume crime reductions, however, will depend in part on the success of the reform and corrective measures applied to convicted offenders.
PART C – ASSESSMENT AND RECOMMENDATIONS
SYNOPSIS OF PART C

Chapters 9, 10 and 11 constitute the final section of this thesis – Part C. Chapter 9 is an evaluation of the effectiveness of forensic DNA in terms of the goals of the justice process, drawing on the data obtained while researching chapters 4 to 8. The chapter begins by setting out the goals of justice, and then provides two anecdotal case histories of where DNA helped achieve just outcomes. It then considers the value of DNA in excluding suspects during investigations, and in exonerations after trial. The proportion of reported cases in which forensic DNA was found to be used is then examined, and in all offence types but homicides, it was used in less than two percent of court cases. The quality of DNA evidence, that is, its strength in relation to other types of evidence, and its influence on decisions in the justice arena, is assessed. Generally, cases with incriminating DNA were both more likely to reach court and juries were more likely to convict. This is followed by a summary about the potential of DNA to reduce property crime, an aspect still to be realised in Australia. Some costs and benefits of forensic DNA, of DNA databases, and effects on investigations and in the courts are then discussed, and it would appear that the benefits accruing to date have yet to justify the expenditure. Two proposals to vastly increase forensic DNA use are critically analysed, but found impractical as they relied on unrealistic levels of trace DNA being available at crime scenes. Lastly, the possibility of deterrence through DNA is examined, but a lack of criminological studies to date would indicate that this topic requires researching.

Chapter 10 raises issues of privacy and civil liberties, commencing with an historical background to the use and misuse of genetic data. This includes the searches for a “criminal gene” and for genetic links to criminal behaviour. Databases are contrasted with databanks, and it is questioned whether our DNA is really private. Civil liberties issues discussed include whether providing DNA is a form of self-incrimination; how DNA has helped exonerate the innocent; wrongful convictions based on flawed DNA evidence; whether occasional “mass screenings” with DNA are a reversal of the onus of proof; concerns with databases and “function creep”, and the planting or “forgery” of DNA evidence through amplicon contamination. It was concluded that, unless
properly regulated, DNA databases and sampling have the potential to erode improperly and inappropriately, privacy and civil liberties.

In Chapter 11, a balance is sought between the goal of police and government on one hand to provide a safe society, and on the other, the rights to privacy and civil liberties expected by individuals in Western liberal democracies. The chapter addresses the issues of concern raised in Chapter 10, and suggests recommendations on how these may be resolved. The general approach taken is to favour increased police powers, through legislation enabling, for example, covert collection of samples and occasional mass testing. However, this legislation would be coupled with the protection of individual rights through greater regulation of those police powers that would involve use of court orders, warrants or of regulatory monitoring.
CHAPTER 9: EVALUATION OF THE IMPACT AND EFFECTIVENESS OF DNA PROFILING IN TERMS OF THE GOALS OF CRIMINAL JUSTICE

INTRODUCTION

This chapter begins by examining the goals of criminal justice, the primary ones being the provision of a safer society through crime control and prevention, and a more just society by identifying and sanctioning offenders. Three stages of crime prevention are identified, along with the operation of the three traditional components of the justice process: the police, the courts and corrections. The chapter then outlines a number of cases where convictions through DNA have brought closure for victims and their families, and provided public satisfaction with the justice process. A further important measure in assessing the overall effectiveness of DNA is the levels of use for DNA evidence in different offences, and the ceilings on this use; that is, the proportion of cases in the justice process where DNA is presented in evidence. These are estimated from available primary data. The effectiveness of DNA evidence in court, or the quality of the evidence, is then evaluated for offences against both persons and property from findings made in earlier chapters. A Table is used to summarise and compare for different offence types the effects of forensic DNA on cases reaching court, on guilty pleas, on jury decisions and on sentencing. Whether DNA may have the potential to contribute to volume crime reduction is also examined. Although the benefit–cost aspect of using DNA is not evaluated in a structured manner or in depth, some results from the analyses in this thesis are apparent: no significant savings on guilty pleas induced by DNA for serious offences for example, were found. The findings from primary data in this thesis are contrasted with some theoretical projections for DNA that advocate vastly expanded usage. Lastly, some miscellaneous issues are analysed: the possible deterrent effects of DNA, its ability to exclude suspects from investigations, and its use in exonerations after trial.
The Goals of Criminal Justice

Criminal justice goals include creating a safer society through the reduction or prevention of crime, upholding the law through detecting and investigating offences and providing corrective services for offenders. The Queensland Government’s vision statement for its crime prevention strategy was: “to build safer and more supportive communities in Queensland through targeted, coordinated and consultative initiatives that reduce and prevent crime” (Queensland Government, 1999: 5). The mission statements and visions of the various criminal justice bodies charged with policy administration in the State are informative about their conception of their role in this process. The Queensland Police Service Vision includes as one aim, “…to enhance the safety and security of our community”, while its Mission statement includes “…preserving peace and safety, preventing crime and upholding the law…”. It counts as one of its Guiding Principles “…to prevent, detect and investigate breaches of the law by the use of problem-solving approaches.” (QPS, 2001b: 5).

The State’s Department of Justice and Attorney General, which administers the courts, proclaims its “…mission is to deliver a fair, open and accessible justice system for all Queenslanders” (Department of Justice and Attorney General, 2004). As the third strategic partner in criminal and social justice in the State, The Corrective Services Department defines its role as providing

…Community safety and crime prevention through an integrated correctional services system delivering humane containment, supervision and interventions for offenders (Department of Corrective Services, 2003: 3).

Reducing the level of criminal activity and consequent damage, that is, reducing the numbers of active criminal offenders and their victimising actions, is a means to preventing crime and achieving a safer society. Criminologists have defined three levels or stages of crime prevention, designating these primary, secondary and tertiary, as defined below (Australian Institute of Criminology, 2003: 1). Forensic
DNA operates at the tertiary stage, but the use of DNA for all offence types is limited to preventing further offences only after one or more crimes have already occurred and an offender’s DNA is recorded. A feature of most other crime prevention strategies is that they aim to target the causes of crime, rather than its effects. They also aim to reduce markedly, or to remove, the factors that contribute to crime (Pease, 2002: 947-79; Cameron and Laycock, 2002: 313-31). DNA testing is therefore part of a final stage in response to crime – and although this may not be ideal, DNA evidence has become an essential element of the justice process.

Primary crime prevention strategies attempt to pre-empt problems either through situational prevention or through social interventions. The former method seeks to reduce opportunities for crime by focussing on the environment – using target hardening, for example, through building or landscape design (Geason and Wilson, 1989, 1990: Clarke, 1995: 91-150; Hill, 1998: 1-6). Social interventions consist of altering factors that may affect a person’s tendencies towards criminal activity, such as poverty, unemployment or low educational attainment, while strengthening community and social structures. School-based and community-based programs are examples of such initiatives, although these remedial programs often require a whole-of-government approach to address the issues involved (Lauchs and Romeo, 2002: 11). Secondary level crime prevention is directed more at the individual, and aims to change people’s behaviour, especially those judged at high risk of pursuing a criminal career. Youth programs, for example, can focus on rapid and effective early childhood interventions, while neighbourhood dispute centres may target high-risk neighbourhoods (Homel et al. 1999; Welsh and Hoshi, 2002; Cameron and Laycock, 2002: 313-31).

The tertiary stage, where DNA evidence may be used, is implemented by the courts and is designed to lower crime through deterrence, incapacitation and rehabilitation (Australian Institute of Criminology, 2003a: 1). Indirectly, it operates through effects on socialisation, for example by promotion of social norms. Courts and corrections use incapacitation by detaining offenders in prison, thereby depriving them of opportunities to commit crimes. Deterrence or punishment can be both specific and general. Whereas specific deterrence is directed at the offender being punished,
general deterrence is intended to ensure that others will not commit similar offences in future. Rehabilitation is treatment aimed at changing the offender’s behaviour in order to prevent future criminal acts. Further categories of tertiary interventions are community restraints, combining rehabilitation with restraints, and structure, discipline and challenge programs (Layton Mackenzie, 2002: 330-404).

One criterion for evaluating the effectiveness of forensic DNA in the justice process is the degree to which it can contribute to convictions in court – thereby leading to the tertiary stage of crime prevention. A core element of DNA is its ability to identify offenders and have them brought to justice. Therefore, a measure of incapacitation can be the number and severity of custodial sentences imposed that are attributable to forensic DNA. However, while there may be a nexus between convictions and crime reduction, the crime reduction rate may not necessarily follow directly from the conviction rate. This applies particularly to property offences where a small number of repeat offenders are responsible for a high proportion of crimes in some areas (Salmelainen, 1995: 24). An alternative and more direct measure of DNA effectiveness for property offences is the difference, if any, it might make to crime levels. Operation Vendas, conducted by the New South Wales Police and discussed in Chapter 8, was a step in this direction (Jones and Weatherburn, 2004).

**Achieving justice through DNA**

A number of highly publicised cases in Queensland and elsewhere have demonstrated the spectacular successes that forensic DNA has achieved in assisting to solve crimes that may otherwise have remained unsolved. Among these were the so-called “Catwoman” case and the murders of Robyn Kennedy and Janet Phillips. Public satisfaction with the outcomes achieved can be assessed by comments from the victims’ relatives and from media reporting of the cases.

On 1 March 1998, Kathleen Marshall aged 52, a prominent veterinarian and director of the Cat Protection Society of Queensland, was found brutally murdered in the downstairs surgery of her suburban home. She had suffered multiple stab wounds. Samples of blood splattered around the surgery were taken for analysis. No witnesses
or weapon were found and police interviewed numerous associates and nearby residents, taking many blood samples for analysis. One of the last of those interviewed was Andrew Fitzherbert, a palmist who worked out of a spiritualist church.

Fitzherbert denied knowing Marshall or ever being in her home, nor was there any record of them meeting, but Fitzherbert refused to provide a blood sample for analysis. Investigators applied to a magistrate for permission to take such a sample, but were refused on the grounds that this would constitute an invasion of privacy. Perhaps oddly, the magistrate did not see such problems in granting a search warrant on Fitzherbert’s house, where investigators retrieved a handkerchief from which they took mucus for analysis. The DNA profile from the mucus matched tiny spots of blood left at the crime scene. There was no motive led by the Crown, and the significant evidence was largely circumstantial in the form of the DNA. A Supreme Court jury convicted Fitzherbert after it heard that the chances of the blood at the scene belonging to anyone else were \(14 \times 10^{15}\) to one. Although Fitzherbert’s later appeal against the conviction was rejected (Oberhardt, 1999: 3, 2000a: 11; Scott, 1999: 9), an application was being made in early 2004 to have the blood samples retested (Scott, 2004: 5).

DNA has also been crucial in solving murders years after their occurrence. Janet Phillips, a 15-year-old Wynnum schoolgirl, was abducted, raped and stabbed to death in 1987. Her naked body was found in a drain. Eleven years later, DNA technology was sufficiently developed to enable trace evidence to be linked to Lloyd Clark Fletcher, who was jailed indefinitely. According to the victim’s mother, “If they had had the DNA testing developed 11 years ago, we may not have had the misery and heartache. I thank God for DNA, otherwise Fletcher would have gotten away” (quoted in Doneman, 1998: 11; see also “Rights of victims of crime” in Chapter 10). Although an opinion survey of crime victims or of their relatives was outside the scope of this research, anecdotal information encountered indicated a high approval for the results DNA achieved.
Another case with no witnesses, no obvious evidence and where the victim was randomly selected, was the 1990 rape-murder of Robyn Kennedy. Kennedy had attended a wedding reception in inner Brisbane and left about 3 am to catch a taxi home. Her body was found strangled with a pair of pantyhose in the Bunya State Forest. In 1996, DNA linked the crime to a former taxi driver, Bentley White, held in custody for a rape offence in the same area and which had similarities in the *modus operandi*. White was later convicted of the murder and sentenced to mandatory life imprisonment (Lloyd, 1997: 15; Vale and Hart, 1998: 7; Doneman, 1998: 11).

Numerous other cases where DNA solved otherwise “unsolvable” crimes and led to justice being achieved have been recounted internationally: for example, in the US by Inman and Rudin (1997) and in the UK in the joint ACPO/FSS evaluation of DNA (Speakman, 1999).

*Exclusion or elimination of suspects*

Another claim made on behalf of DNA is its ability to exonerate or to eliminate suspects. For sexual offences in the US, between about 25% and 33% of suspects nominated by law enforcement agencies were exonerated through DNA profiling (Miller, 1991: 12; Neufeld and Scheck, 1996: xxviii: Wasserman et al. 2000: 3). Only one Australian case was encountered in the literature where a prosecution was discontinued after DNA results became available. This was in Tasmania in 1998, where Robert Cowan had been falsely charged with rape (Alastair Ross, then Executive Director of NIFS cited in Davies, 1999: 102). However, analysis of primary data from the QHSS laboratory found that in only two of 85 sexual offence cases randomly sampled (2.4%) where DNA other than that of the victim was profiled, were suspects eliminated before charges were laid. In the remaining 83 cases, DNA testing confirmed the link between the complainants and defendants (Briody, 2002b: 24). This would indicate that the use of DNA for exonerations would vary widely with the investigative practices among different jurisdictions. It appears that investigators in the US might tend to cast a wider net of suspects and rely more on scientific confirmation of their innocence (Grice, 2001), but this has the drawback of contributing to laboratory backlogs.
Most data on exclusions in the literature derived from the early to mid-1990s, and related to sexual offences. In these cases, DNA was taken from semen in the victim’s vagina or on the victim’s clothes, often with a very high likelihood that it came from the offender. In other offence types, depending on the circumstances of the case, the presence of a person’s DNA may merely indicate that the person was present at the scene at some time, or that their DNA may have been transferred there (Saul, 2001: 93). An assault victim’s blood on someone’s shoes might show that the second person was present when the victim bled, but without witnesses or admissions it can prove little about their actions or intent. In the backpacker case cited earlier in this chapter, DNA analysis of blood spots found at the scene would tend to incriminate persons rather than to exclude them. Blakey found in the UK that up to 19% of DNA identifications from the national database were accounted for by innocent explanations (2002: 11). Ultimately, investigators can reconstruct events with help from DNA, but cannot rely on it entirely to prove their cases.

Exonerations after trial

By late 2004, only one case in Australia, *R. v. Frank Alan Button* ([2001] QCA 133), had used DNA in an appeal decision to overturn a conviction, as DNA profiling had incriminated another suspect (Crime and Misconduct Commission, 2002: 1-10; Australian Broadcasting Commission, 2002a; Dingle, 2001: 271-276). Although obviously important for Mr. Button, the extent to which DNA has exonerated the innocent after trial in Australia has therefore been minimal. In Canada it has been used in at least four cases in this way (Windover, 2000: 1), while in the US more than 140 convictions had been reversed or overturned by March 2004 (McMurtrie, 2004). The next chapter discusses this topic in more detail under the heading “Exonerating the innocent through DNA profiling”.

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Quantity of the evidence: proportion of cases where used

A significant element when evaluating forensic DNA in the justice process is the proportion or percentage of cases for which it can be used in investigations and in court for different offence types. If DNA evidence can be presented in a majority of investigations and court cases, its impact and value should be far greater than if it is utilised in only a small minority. The degree to which DNA evidence is being used, or can potentially be used, provides one indication of its effectiveness as a criminal justice tool. While accurately assessing the levels of usage presents some difficulties in implementing the measurement process, it is far preferable to obtain some idea of usage levels than to have none at all. As Wasserman and colleagues remarked on DNA typing, “…little research has been done on its routine utilization and impact…We know very little about how frequently typing is being employed in cases where it is available and potentially useful.” (2000: 1).

Quantitative estimates can be made about the proportion or percentage of cases that reach court based on available data. One approach takes numbers of cases where court statements are made that were referred to the forensic laboratory for different offence types. This figure is then divided by numbers of the same offences recorded by police per year. However, in the present research, the different characteristics for each offence type and availability of data necessitated varying the approach. Because forensic DNA was found in Chapters 4 to 7 to constitute potentially powerful evidence, reasons should be sought as to why it is not utilised more frequently. Examining these reasons can also assist in assessing the viability of proposals for universal DNA databanks for crime control that contain all citizens’ profiles (Cronan, 2000; Kaye and Smith, 2003). These proposals will be referred to later in this chapter and again in Chapter 11.

Surprisingly perhaps, the important question about usage levels is rarely raised in the literature and largely has not been investigated. Apart from the study by Taupin (1994) on sexual offences (see below), no quantitative studies were found that examined this issue. Jeremy Gans, a researcher at the University of Melbourne whose
study area is the law regulating DNA identification, has related the levels of DNA usage to budgeting and expenditure, a subject covered later in this chapter. On the issue of usage, Gans observed:

DNA identification is costly and is of limited or no efficacy with respect to the investigation of many crimes, i.e. where identification is not an issue or no crime scene profile is obtained. Any decision to expand the use of DNA identification should be made only after a careful, informed cost-benefit analysis. Overuse of DNA identification may drain resources from other aspects of policing (Gans, 2003: 10).

The absence of research on usage levels may be attributed in part to difficulties with data availability, with data tracking and with compatibility across laboratory, police and court records. In Queensland, the Crime and Misconduct Commission’s (CMC) report on forensic services observed on this issue, “Another challenge comes from agencies using different electronic case identifiers. Queensland Health uses the victim’s name, the DPP relies on the name of the offender and the QPS uses a CRISP [Crime Recording Information System for Police] number” (CMC, 2002: 24). This situation was rectified in late 2003 with the introduction of a computerised Forensics Index system that facilitated case tracking across agencies through shared case identifiers and networked computer terminals.

Despite comments in the CMC report, estimating levels of DNA evidence use in relation to reported crime might be accomplished more easily in the States of Australia than elsewhere. In Queensland, where most data for this study were collected, one police organization and one forensic laboratory lie within the one State legislative jurisdiction; but such congruence is exceptional. In the United States by contrast, 120 DNA profiling laboratories serve over 17,000 federal, State and local law enforcement agencies throughout 51 States (Steadman, 2002: 1), while in the United Kingdom two Forensic Science Service laboratories provide services to 43 police forces in England and Wales.
Table 9.1, reproduced below, shows the approximate percentage of court cases where DNA could be used as derived from primary Queensland data. The Table is divided along one axis into the four main offence types categorised in this thesis, and along the other axis is their progress through the different stages in the justice process. A noticeable feature of Table 9.1 is that forensic DNA was used in less than two percent of cases for all categories of offences but homicides. The absence of laboratory records for many offences, such as white-collar crimes like tax evasion and fraud, stealing, shoplifting and traffic offences indicated that, in nearly all cases, they were unsuitable for yielding DNA samples as trace evidence. An examination of the proportion of cases where DNA was used for four main offence types follows.

Table 9.1: Summary of Usage and Effects of DNA Evidence for Various Offence Types in Court

<table>
<thead>
<tr>
<th>Offence Type</th>
<th>Approx. % of cases where DNA evidence used</th>
<th>Effects on Cases Reaching Court</th>
<th>Effects on Guilty Plea</th>
<th>Jury Convicts</th>
<th>Custodial Penalty</th>
<th>Length of Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual Offences</td>
<td>Serious sex offences 9%. Overall sex offences 2%</td>
<td>DNA cases marginally more likely to reach court</td>
<td>Nil</td>
<td>Significant association of DNA with guilty finding</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Homicides</td>
<td>20% of cases during investigations 10% of court cases.</td>
<td>DNA cases more likely to reach court¹</td>
<td>Nil</td>
<td>Highly significant association with guilty finding</td>
<td>Not applicable. (All homicide offences attracted custodial penalties)</td>
<td>Nil sig. assoc. with penalties for manslaughter offences²</td>
</tr>
<tr>
<td>Serious Assaults</td>
<td>&lt;1%</td>
<td>Nil</td>
<td>Nil</td>
<td>Marginally significant but based only on a small sample (N=28)</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Property Crimes</td>
<td>&lt;2%</td>
<td>Highly significant association with cases reaching court</td>
<td>Highly significant association with guilty pleas</td>
<td>Not applicable. Property offences in higher courts mostly went ex-officio</td>
<td>Nil</td>
<td>Nil</td>
</tr>
</tbody>
</table>

¹ This result should be interpreted with caution, as only 11 of the 150 cases sampled were not prosecuted.
² Murder offences were not analysed because all incurred the mandatory life sentence.
A Summary of the Material Presented Herein

Sexual offences

During a pilot project on sexual offences for this thesis in 1999, DNA evidence in the form of a scientist's court statement was found to be used in around nine percent of rapes and attempted rapes, and in two percent of overall reported sexual offences, for 1997-98 in Queensland (Briody, 2002b: 24-25). However, victim surveys suggest that only around 16% of sexual assaults in Queensland were actually reported (Queensland Government Statistician’s Office, 1999: 5). Up to the time of the pilot study, sexual offences were the most common types of offences referred for DNA analysis in Queensland. These percentages conform closely with the findings of a study conducted in Victoria, where less than ten percent of reported sex offence cases were examined in the laboratory (Taupin, 1994: 57-8). For 2002-03, Queensland police reported clearing 74% of reported rapes and reported attempted rapes, and 73% of other reported sexual offences in the same year (QPS, 2003a: 2-3). (Broadly speaking, “cleared” offences are not further investigated, but a full definition of the term is in the Glossary in Appendix A).

In future years, the use of a DNA database is predicted to improve only marginally the proportion of sexual offence cases where it could be used to identify offenders. This is because in close to 90% of such cases, victims were found to know the accused, and in such cases the issue of identity was not in question (Legosz, 1999: 13; NSW Department of Women, 1996: 56). However, individual cases in the UK where DNA contributed leads to unknown suspects through database matches were often those that would otherwise remain unsolved, such as stranger rapes (Speakman, 1999: 1-13).

There are at least two reasons for low DNA usage rates. First, a majority of sexual offences were indecent assaults that left no trace DNA. Second, where DNA might have been found, delays in reporting led to its loss. A Queensland Criminal Justice Commission study found “only 7.8% of sexual offences were reported to police within the first week of their occurrence” (Legosz, 1999: 15). As noted in Chapter 4, an overwhelming proportion of cases involving child victims involved delays in
reporting the offence. A minimal two percent of offences against children, who formed over half the victims of sexual offences, were reported within one week of their commission (QCC and QPS, 2000: 5, 48).

Of a sample of 50 sexual offence cases in the pilot study that were referred to the forensic laboratory by police, 32% yielded no DNA for analysis. This compared with findings in Victoria of 30% to 37% of cases having no potential for DNA typing (Roberts, 1993: 46; Taupin, 1994: 59). In 16% of cases in the Queensland sample, testing was inconclusive, being able neither to implicate nor to exculpate the suspect (Briody, 2002b: 24). The same percentage of tests was found to be inconclusive in the United States in 1996 (Wasserman et al. 2000: 3). Reasons for no DNA being found can include delays in reporting the offence, sample contamination, the offender not ejaculating, wearing a condom or having undergone a vasectomy (Cox, 1999: 16). In cases where vasectomies are totally successful, no sperm is available for analysis, leaving only the relatively remote possibility of analysing any squamous epithelial cells in the seminal fluid, which otherwise contains no nucleated cells for DNA analysis. Figures from NSW indicate that the chances of getting a DNA profile from a semen sample were over 50%, but “this figure is higher if a neat semen sample is found, such as on bed clothes” (Wilson-Wilde, 2001: 4).

DNA cannot help resolve matters in cases where consent, rather than the identity of the other party, is at issue; but importantly, such cases are in the minority. The issue of consent did not apply in a majority of reported sexual offences in Queensland, where 58% of victims were found to be below the age of consent (Legosz, 1999: vii). Similarly in Victoria it was found that less than ten percent of such cases reaching court were contested on the issue of consent (Law Reform Commission of Victoria, 1991: 39, 86). This low percentage of cases where consent is the issue does not necessarily imply that there is not a dark figure of unreported rapes where consent is the pivotal issue.
For the purpose of the research for Chapter 5 on homicides, all murders reported in Queensland during one year were tracked through the justice process to determine the number in which probative DNA evidence was presented in court. Thirteen DNA cases were located among forensic laboratory files from a total of 69 reported murders in Queensland in 1998-99. That is, 19% were found to use DNA evidence during the investigation phase to link the accused to the crime. These figures were gathered in 2001, after allowing a two-year interval for cases to progress through the legal process to the appeals stage. Six of these thirteen cases ended in pleas of guilty and did not go to trial, leaving seven of the 69, or ten percent of cases, that used DNA evidence in court. A range of ten to 20 percent of cases is shown in Table 9.1 as having used probative DNA evidence. As was found in Chapter 5, the availability of incriminating DNA cannot be credited statistically with inducing these guilty pleas, as no significant correlation was found between pleas of guilty and incriminating DNA evidence.

There is no reason to expect an increase in this proportion in the foreseeable future, as police investigation techniques in 1998-99 fully utilised DNA evidence, and Profiler Plus technology was being applied. However, the sample size is somewhat limited. Of all crimes, homicides are the most thoroughly investigated by police, and many more than the 13 were referred in that year to the laboratory for testing, but did not produce results of a probative nature. Weedn and Hicks (1997: 17) have promoted the use of DNA based on one US study revealing that blood was found at 60% of homicides (Parker and Peterson, 1970). However, in the case files examined for this research, blood on a murder victim’s clothes was frequently found to have come from the victim, and was therefore of no probative value in confirming any link to a suspect. Such testing is still essential though, in order to determine the origin of any blood found. The relevant Queensland Health Scientific Services (QHSS) Annual Report for 1998-99 indicates that 336 deaths were referred for DNA testing in that
year, but this figure does not separate the larger categories of accidents and suicides from homicide cases (QHSS, 1999: 4).

Reasons why more homicides did not produce probative DNA evidence were examined while researching Chapter 5. Some homicides did not result in any charges, such as when the perpetrator committed suicide immediately afterwards. In other cases, no biological trace evidence resulted in a linkage, because of the method employed by the offender: shootings, strangulations, "shaken baby" syndrome, deaths through arsons, killings by lethal drug injection, some stabbings, drownings and killings where the victims were later found in rivers and so on. As with fingerprints, biological trace evidence other than blood had little or no probative value where the offender had legitimate access to the crime scene, as in domestic killings. Almost two in five homicides in Australia occurred between family members who reside together (Mouzos and Rushforth, 2003: 1).

Around 80% of homicides researched for Chapter 5 were found not to include DNA evidence in the prosecution case, while a further ten percent did not reach court because of guilty pleas. No homicide cases sampled from 1998-99 were solved by cold links from a DNA database, but a very high proportion was still solved. Police reported 87% of cases from 1998-99 as being solved in the same year, while in 2002-03, 90% of murder cases were reported as cleared (QPS 1999: 6; 2003, 3). Although Queensland held a rudimentary database in the years examined, an expanded DNA database linked nationally may be expected to add little to this proportion by way of cold links – the exception being where DNA may help lead to charges in otherwise unsolvable cases. This assessment concurs in part with that of Tracy and Morgan in the United States as was noted in Chapter 3 (Tracy and Morgan, 2000: 650). Further, while DNA evidence was effective in linking defendants to crime scenes, to victims and to exhibits in a number of cases, issues frequently in contest in murder trials were whether defendants acted in self-defence or under provocation. Forensic DNA was unable to assist such issues.

**Serious assaults**
Chapter 6 of this thesis examined serious assault cases, and it was found that, despite steady growth in offences of this type, less than two percent of cases were referred to the forensic laboratory in any of the thirteen years examined. It was noted that in 2002-03, the number of assaults reported to police was 19,420, of which police cleared 13,979 or 72% in the same period. However, only 336 cases were referred for DNA profiling in that year (QPS, 2003a: 3; QHSS Annual Report 2002-03). This referral proportion of two percent was not exceeded in any of the previous twelve years. Further attrition of cases occurred in the laboratory where no DNA could be profiled from the samples submitted, where profiles could not be matched to any suspects or to profiles on the database, or where the analysis was discontinued after a guilty plea rendered it redundant. It was estimated that court statements were issued by the laboratory in less than one half of one percent of reported assault offences.

As with homicide cases, DNA evidence was more likely to be used where blood was available in relation to the crime scene, and particularly where DNA from blood could link a suspect to the victim or to the scene. Where blood is available from a crime scene, the chances of profiling DNA from it are over 90% (Wilson-Wilde, 2001: 4). Offences where blood was more common were those of unlawful wounding and of causing grievous bodily harm, and in many such cases blood on the suspect’s clothing or shoes was found through DNA to have originated from the victim.

Many more serious assault offences, however, occurred without a residue of blood, or without blood that could constitute probative evidence, such as the victim’s blood on the victim’s clothes. This would explain the relatively low usage rates for DNA technology. For example, the control group in Chapter 6, where there was no DNA evidence, included a victim being deliberately struck by a motor vehicle, the choking of a prostitute, burglary with violence that resulted in bodily harm, a domestic-type assault of a former spouse, another domestic incident resulting in a fractured nose, robbery and assault with a tyre lever, punching to the face during a pub brawl causing a fractured eye socket, and other assaults resulting in broken bones.

It was found that investigators, in reconstructing events in serious assault cases, relied heavily on witness accounts where available. As was found in the analysis in Chapter 6, close to 70% of serious assaults culminated in pleas of guilty, irrespective of
whether or not DNA evidence was available. In the relatively small number of cases that were heard before a jury, DNA was a predictor of a guilty verdict, although this finding was based on a sample of only 28 cases. After allowing for guilty pleas, therefore, DNA evidence was found used in court in fewer still than the one half of one percent of reported serious assault cases mentioned above.

**Property offences**

In 2002-03, the Queensland Police Service’s *Annual Statistical Review* reported 278,995 property offences in the State. Both for unlawful entry offences overall and for unlawful entry of dwellings, police reported 14% as being cleared (QPS, 2003a: 4-5). In researching Chapter 7, it was found that in 2002-03, police referred samples from 4,894 volume crimes to the State’s forensic laboratory for analysis (QHSS, 2003). The proportion of property offences in which DNA evidence was gathered in Queensland and referred to the forensic laboratory was therefore less than 2% of the numbers of cases reported. However, for the same year, the Police Minister reported a total of 1,100 DNA identifications for all offence types (Queensland State Budget 2003-04: 16). The fact that less than two percent of property crimes were referred to the laboratory, and far fewer identifications were reported (primarily due to a backlog of crime scene samples), would suggest that forensic DNA was having only a minimal impact, if any, on property offences in the State to this point in time. One reason for this is that stealing, the largest of all crime categories included in the Australian national statistics, is nearly always unsuitable for DNA profiling due to a lack of residual biological evidence. Stealing offences include theft from a motor vehicle, bag snatching, shoplifting, and theft of animals and bicycles, and of items like mobile telephones.

For the specific offence of burglary, overseas data are available on the proportion of offences at which DNA evidence was found. In Chapter 8, it was noted that in the UK and New Zealand, where national DNA databases have been operating since 1995 and 1996 respectively, DNA was collected from between three and five percent of reported cases (Blakey, 2000a: 18-21; Walsh et al., 2002: 212). DNA matches were achieved in close to half of the cases in the UK and New Zealand, while nearly half of
the UK matches resulted in charges being laid (FSS, 2003: 26). After adding for additional charges due to the multiplier effect, the UK DNA database was found in Chapter 8 to have achieved convictions, on average, in close to one percent of domestic burglary cases. While the strategic management of DNA identifications and the targeting of recidivist offenders has been theorised as potentially reducing volume crime levels, no published criminological studies were found to date that supported this contention.
Quality of the evidence: DNA and the courts

DNA evidence has been used in courts in Queensland since 1991, but profiles that indicated individualization were not available until 1996, with 9-gene multiplex becoming available in 1998. In nearly all cases, presentation of DNA was for prosecution purposes, because in cases where it excluded suspects, charges against those persons were not pursued. Table 9.1 above summarises the influence of DNA for the four offence categories where it was most frequently used at various court stages. From the results of the statistical analyses in Chapters 4 through to 7, the control-comparison studies indicated that forensic DNA constituted very effective evidence when presented by prosecutors. It assisted in decisions to prosecute some cases, rather than to nolle, and showed a significant association with decisions to prosecute in property, sexual offence and homicide cases. Further, incriminating DNA evidence demonstrated a powerful influence on juries’ decisions to convict. However, there were no significant associations between DNA and sentencing decisions where cases were heard before the courts. DNA evidence was found not to act as a predictor of the imposition of custodial penalties, nor to have any significant positive association with the length of sentences; but these results on sentencing should be treated with some caution, as they are based on small samples left after guilty pleas.

Potential for forensic science to reduce volume crime

Many articles on forensic DNA usage were found during this research to quote laboratory match or “hit” numbers as a measure of the success of forensic DNA in relation to volume crime. As explained in Chapter 8, these were regarded more as commentaries than as criminological studies, in that the methods they used were not capable of producing negative findings. Evaluations that traced “hits” to the point of conviction were the exception, one such in the UK being that by the ACPO/FSS (Speakman, 1999). During this research, only one reference was found to DNA being incorporated into a successful burglary reduction initiative (FSS, 2004: 11). This was
in 2003-04, in the West Midlands, where police employed the FLINTS program, but no report on this initiative was available.

Only one evaluation was located where a rigorous control-comparison method was employed to assess whether forensic DNA could impact on volume or property crime reduction, and it found that no reduction was achieved. This was the study, reviewed in Chapter 3 and again referred to in Chapter 8, by the New South Wales Bureau of Crime Statistics and Research (BOCSAR) of Operation Vendas (Jones and Weatherburn, 2004). In concluding the report on the operation, the authors noted:

The current operation may not have been successful in achieving its goal, but by systematically working through the means by which the operation may have brought about these changes, we get a much clearer picture of the reasons for failure and the areas for improvement in the future. The process may sometimes be painful and disappointing. However the alternative – investing heavily in new strategies without evaluating them – is hardly worth considering (Jones and Weatherburn, 2004: 35).

Evidence to the Victorian Law Reform Committee’s inquiry into forensic DNA indicated that a negative effect of the submission of evidence from volume crime scenes contributed to pressures on laboratories already faced with backlogs from more serious criminal cases. It further noted that, based on the UK experience, “there is therefore some doubt as to whether the investment in the collection of DNA from volume crime scenes is being repaid in terms of the resulting prosecutions or convictions” (Victorian Law Reform Committee, 2004: 473). On the other hand, the BOCSAR report noted that crime scene attendance by forensic investigators increases victim satisfaction, helps reduce fear of crime in the community and leads to more offenders being brought to the courts. These were seen as important goals from the vantage point of justice, even without the achievement of improved crime control (Jones and Weatherburn, 2004: 35).
DNA evidence, benefits and costs: the price of justice

This thesis is primarily aimed at assessing the effectiveness of DNA in relation to crime, and it was not intended to examine quantitatively or in a structured manner the issue of cost-effectiveness in depth. The division of offences into serious crime and property crime is used for assessing the cost-effectiveness of forensic DNA. As will be noted below, in discussing possible deterrent effects of DNA as a cost advantage, it appears unlikely that violent or sexual offenders will be deterred by the likelihood of trace DNA being used to relate them to the crime (Freckelton, 2003: 27). It would be very unusual for such behaviour to be so thought out and rational. The benefit-cost considerations here for serious crimes do not, therefore, assume any deterrent or crime preventive effects accruing from DNA, with the exception of the (limited) incapacitation effect on offenders whose further activities are curtailed after being imprisoned based on DNA evidence.

For volume or property crime, benefit-cost analysis might indicate the effectiveness of crime prevention or reduction programs. Such analysis is complex, and according to Adam Graycar, then Director of the Australian Institute of Criminology, is in its infancy (Chisholm, 2000: 1). The UK Home Office is in the process of developing a comparative analysis method for crime reduction programs. According to Dr Alaster Smith of the UK Home Office’s Policing and Crime Reducing Unit:

At present it is not possible to estimate how well the DNA Expansion Programme compares with others in reducing crime. Evaluations of other crime reduction programmes are only now coming to fruition and the Economic and Resource Analysis Unit of the Home Office is shortly to embark on a study to collate and standardise effectiveness measures which will, when completed, make meaningful comparisons possible (Smith, 2003).
The Victoria Police too have recognised the need for providing transparency about costs of forensic services and have recommended that a Planning Unit review in a structured way the cost-effectiveness of forensic services, acknowledging that, “patterns of usage in forensic services in themselves do not indicate investigative cost-benefit” (Victoria Police, 2002: 41).

A general comparative impression for forensic DNA costs in Queensland, however, can be gained from available figures. As noted in Chapter 1, by 1999 the State government was spending $1.3 billion annually on police, courts and prisons (Department of the Premier and Cabinet, 1999: 3). By 2002-03, according to the Crime and Misconduct Commission’s Report reviewed in Chapter 2, the estimated operating costs for QHSS forensic science services were $6.2 million. This included not only the DNA testing in the forensic biology section, but also covered costs of forensic chemistry, forensic toxicology and forensic pathology (CMC, 2002: 17). In 2001-02, police expenditure on DNA formed less than 0.2% of the Police Service’s budget: “$1.9 million for the State-wide provision of DNA services for the purpose of criminal investigations” in a budget that allocated Police $870 million for operating and $86 million for capital expenditures (Queensland Treasury, 2001: 2). However, government expenditure on DNA testing in 2001-02 is likely to be understated, as an additional $11 million over three succeeding years was promised in 2004 for testing to help clear a backlog of exhibits (Australian Labor Party, 2004: 3).

It can be seen that combined expenditure by Queensland Police and Queensland Health would still form a very modest proportion of the annual State budget for justice services. For the fraction of work performed by the laboratory relating to testing of samples from the known offender’s database, a more accurate figure could be calculated from totalling invoices from the QHSS to the police for these purposes, but this was outside the scope of the present research. Some conclusions that can be drawn from this research, however, are discussed below in relation to specific offence types. These have some implications for costing because in some instances they differ from official estimates, particularly in relation to the relationship between DNA evidence and guilty pleas. The CrimTrac national DNA business case, for example, relies on cost savings based on increases in guilty pleas attributed to DNA usage, but
does not cite any studies to support this claim, quoting instead “international experience” (Nearhos and Bowman, 1999: 68-69). Individual States, which in turn modelled their own business cases on the national one, are likely to have adopted these same assumptions.

**Serious crime and court**

The first area examined is how DNA evidence impacted on court costs for serious offences. The statistical analyses of 550 cases using the control-comparison method for the three serious offence categories where DNA evidence was used (sexual offences, homicides and serious assaults) indicated that DNA evidence was significantly associated with more cases reaching court in all but serious assault cases. Table 9.1 above illustrates these findings.

In 1989, Professor Joseph Peterson of the University of Illinois predicted that DNA evidence could tend to push more cases to trial, particularly where the prosecutor refuses to bargain or the defence wish to challenge the scientific evidence before a jury (1989: 61). This reasoning goes against the more intuitive prediction that when available, DNA will cause more guilty pleas and more plea-bargaining. One example of Peterson’s prediction was apparent in 2003, when barristers in Victoria indicated they would challenge DNA evidence vigorously in court after evidence in the Jaidyn Leskie murder case was found in the laboratory to be contaminated by DNA from a rape victim in an unrelated case (Moor, 2003: 1). The findings of the present research – that more cases reached court where incriminating DNA evidence was presented – indicates that DNA was associated with cost increases in the adjudicating phase through the prosecution of additional cases.

In the same three major crime categories, statistical results in Chapters 4 to 6 showed that DNA evidence played no significant role in inducing guilty pleas from defendants. The only previous quantitative study found to examine this issue empirically was that by Taupin, who found that in sexual offence cases there was, “an increase in guilty pleas with DNA profiling only for stranger type crime” (1994: iv).
The possibility that DNA might contribute to more guilty pleas has been viewed as being financially advantageous.

A projection in the Queensland Police Service’s “Environmental Scan” of June 2000 was that “the conclusive nature of DNA will also cause a greater proportion of guilty pleas resulting in savings throughout the criminal justice system” (QPS, 2000: 17). The Australian government CrimTrac organization echoed this forecast: “When confronted with DNA evidence, guilty suspects may be more likely to confess and plead guilty, saving police time and court costs” (CrimTrac, 2002). Serious offences were tried in the District and Supreme Courts, where significant savings would have accrued if guilty pleas were entered. The analyses in Chapters 4 to 6 demonstrated no significant statistical association with guilty pleas. The suggested explanation for this is that higher penalties for serious offences, along with the possibility of an acquittal, act to encourage the accused to opt for trial rather than to plead guilty.

While DNA typing can be credited with providing greater justice for the community because of its greater accuracy and reliability over the earlier forensic serological techniques, it also placed an increased financial burden on the taxpayer where it acted to increase the number of court cases and, following more jury convictions, its association with a larger prison population. Court delays caused by laboratory backlogs also added to costs associated with DNA. An associated argument therefore, is that through imprisonment DNA could be credited with preventing offences, and from creating more victims. A factor that cannot be quantified is the mental and emotional satisfaction victims and others in the community experience when DNA evidence helps to convict offenders.

**Property offences**

With the range of property crimes, DNA evidence was shown in Table 7.3 to have a very highly significant association with guilty pleas. Cases in the control group without DNA showed an 82% rate of guilty pleas compared with a 95% rate in the DNA group – a margin of 13%. Overseas studies have also found a high guilty plea rate associated with property crime. Martin Gaule’s (1999: 8) UK study found an
80% rate of guilty pleas for property offences with DNA evidence, while a New Zealand study of 17 cases involving 50 burglary charges, five rapes and one homicide found in all cases but one a guilty plea was entered (Walsh et al. 2002: 213). However, neither of the overseas studies included a control group for comparison purposes.

Only marginal savings are likely through such guilty pleas associated with DNA in property offence cases. As was seen in Chapter 7, a large majority of such cases ended in guilty pleas, or with formal cautions, irrespective of the presence of DNA. The remaining cases were predominantly adjudicated in the Magistrates and Childrens Courts, where costs are considerably less than those in the District or Supreme Courts. Nearly all DNA cases that did reach the superior courts were combined with larger numbers of non-DNA cases, and went ex-officio with a guilty plea.

Although no comparative estimates were available on Magistrates Court costs in Queensland with or without guilty pleas (Ward, 2004), figures from the UK indicated that the average cost of a guilty plea in a Magistrates Court was around £450, compared with £1,700 for hearing a case before a magistrate following a not guilty plea (Harries, 1999). In 2002-03, the proportion of property offence investigations where DNA evidence was used in Queensland was less than two percent, with a further attrition of case numbers to well below one percent by the time they arrived at the courts. Any projected savings from guilty pleas, therefore, would apply only to the 13% margin or thereabouts, on the less than one percent of cases using DNA. On the other hand, any savings may well be outweighed by costs incurred by courts due to delays in the laboratory caused by processing samples from volume offences (Victorian Parliament Law Reform Committee, 2004: 473).

The proportion of court cases where DNA was used was difficult to estimate accurately, because offenders charged with property crimes in court using DNA evidence were frequently charged with, and prosecuted at the same time for, numerous other offences unrelated to the DNA evidence. A further factor not researched in this study was the extent that prosecutors actually used DNA evidence. A survey by Tracy and Morgan (2000: 655-659), noted previously in Chapter 7, found
that in property crime cases in the US, prosecutors generally did not use DNA even when available.

Effects on costs of police investigations

At least two studies have included the effects on costs of police investigations through using DNA evidence. Those were by Gaule (1999) and Tracy and Morgan (2000), and both were reviewed in Chapter 3. For serious crime in Queensland, DNA was most frequently found to be used as supporting evidence to strengthen the prosecution’s arguments. Cases like Queensland’s “Catwoman” murder (R v. Fitzherbert [2000] QCA 255) outlined above, or the Brampton Island murder (narrated in Chapter 1) were exceptional because of their sole or very heavy reliance on DNA evidence. In the former instances, the costs for DNA profiling tended to function largely as a supplementary investigation costs. DNA costs for prosecuting convicted Rockhampton serial killer, Leonard Fraser, were over $230,000 due to around 420 profiles being required that were associated with the large number of missing women (Freney, 2003). Fraser’s case gained notoriety because of the reappearance of one alleged murder victim, Natasha Ryan, during the trial. Although DNA evidence was essential in relation to some victims, an argument could be made that in view of the defendant’s admissions and other evidence, some parts of the case could well have been successfully prosecuted without such expenditure.

A further argument against major expenditure on DNA databases for serious crime is that over 90% of sexual offenders are known to their victims, and in Queensland 87% of murders sampled in one year were solved without leads from DNA. The counter-argument is that DNA has and can solve major crimes that would otherwise remain unsolved and, in cases where database matches might assist with the early nomination of suspects, it can achieve financial savings on investigations. Reinforcing this argument, it has been found in the UK that “a growing number of matches involving serious crimes followed initial sampling for minor offences” (Forensic Science Service, 2003: 26).
Over a six-year period the UK DNA database was credited with identifying suspects in 832 murders or manslaughters, 275 attempted murders, 1,552 rapes, 1,166 serious robberies and 216 abductions or kidnappings (Gunn, 2001: 26). Unfortunately, these figures did not include a breakdown of numbers of cases where a suspect was already nominated or charged, and in which DNA acted only to strengthen the prosecution case, as distinct from providing a “cold link”. More importantly for assessing the impact of DNA, numbers of convictions achieved from these identifications were not provided.

A related cost-benefit claimed on behalf of DNA is its ability to allow more focussed investigations by directing an investigation along a particular path after a match is obtained from a crime scene (Nearhos and Bowman, 1999: 68; Green, 2000: 9). The counter-argument, that DNA can cause cost blowouts by widening the scope of investigations, is illustrated by a 2003 Queensland case involving the rape and torture of a backpacker. The offences occurred inside a deserted inner city building frequented by intravenous drug users, and in examining the scene police scientific officers took over 300 separate swabs from blood spots found in the vicinity, mostly residue from the drug users injecting (Molinaro, 2003). Fortunately, in the case cited, suspects were identified by other means, otherwise all the swabs may have had to be profiled and a huge investigation launched to interview those identified through the database from the scene samples. This case was by no means exceptional, and debates as to whether DNA narrows or broadens investigations may only be resolved by a quantitative study of cases referred for DNA analysis. As Chief Constable Ben Gunn of the Cambridgeshire Police observed, “[DNA] has the potential to increase overall costs if not managed properly” (1998: 2).

For volume crimes, many in the UK that use DNA evidence do so because they are a result of cold links, and without DNA they would not otherwise be solved. As was noted in Chapter 3, for the small percentage of domestic burglaries in the UK where DNA was found, “the detection [or clearance] rate increased from 14% to 44%” (Forensic Science Service, 2003: 26). As seen in the literature review in Chapter 3, Martin Gaule (1999) found in the UK that investigation costs for volume crime, mainly burglaries, were reduced by 65% with timely processing of DNA evidence in
the laboratory. As Scientific Support Manager for the Sussex (UK) Police, Gaule used an experimental approach to assess the effects of timing of laboratory processing on outcomes from DNA database matches.

Gaule compared the outcomes and costs for 308 volume crime samples submitted to the Forensic Science Service (FSS) for analysis and matching with a turn-around time of 28 days, to 336 cases in a pre-pilot group submitted when a large backlog existed at the laboratory. He calculated the cost savings arising from the improved productivity achieved through faster turn-around times. In the pilot group, detections were made on 82 of the 308 samples submitted, or on 27%, but in the pre-pilot group the figure was only 31 of 336 cases, or nine percent. A very simple cost calculation was made, based on the £210 FSS analysis fee for each case. In the pre-pilot study, the cost per detection was £2,276 (£210 x 336/31) compared to the cost in the pilot study of £789 (£210 x 308/82), a cost improvement of 65%.

Tracy and Morgan (2000) in the US calculated DNA database costs as “astronomical”, and claimed that they did not produce the returns to justify their existence. One costing method used by Tracy and Morgan can be applied to Queensland to estimate the cost of database samples. By 2002, approximately 25,000 arrest and 5,000 prisoner DNA database samples had been taken (Stewart, 2002; Dibben, 2003: 29). Under Part 5, Divisions 3 and 4 of the Police Powers and Responsibilities Act 2000, samples were taken from convicted prisoners held for indictable offences. A “sunset clause”, s.318F in the Queensland legislation, caused such sampling to end on 1 July 2003.

With the cost of laboratory processing at $100 per person sample and $200 for a crime stain sample, profiling costs for person samples reached $3 million, of which prisoner samples accounted for $500,000. In January 2003 it was reported that as a result of the testing, prisoners were being charged with 31 previously unsolved sexual offences. DNA sampling was credited with linking a total of 461 people to crimes (Dibben, 2003: 29). The report did not state whether any of those identified had been arrested previously for the offences, nor the numbers of convictions that resulted from the links. The establishment of the database, on the other hand, can be regarded as an
investment in the solution of future crimes, and the cost of such as asset may be amortised over many years to come.

The New Zealand national DNA database became operational in 1996, but no comprehensive evaluation of costs or of its effects on crime levels have since been conducted (Williams, 2002). However, by 2001, the New Zealand database contained profiles of 13,000 offenders and was linking 33% of submitted crime scene samples to individuals (Harbison, Hamilton and Walsh, 2001; see also Walsh et al., 2002). As was noted in Chapters 3 and 8, it was additionally used to contribute to an intelligence database (Walsh et al., 2002). Canada’s DNA database commenced operations in 2000, and it will be some years before its effectiveness progresses to the point where it can be meaningfully assessed (Windover, 2001).

Judging by current and proposed expenditure, Western governments are confidently allocating funds to forensic DNA. The UK Blair government has committed £208 million over the period 2000-04 to the expanding the DNA program (Gunn, 2002: 9), and in the US, the Bush administration decided to fund DNA technology with $US1 billion over five years from 2003 (US Department of Justice, 2003: 1). Only future research can assess the impact, if any, of this expenditure on crime levels and whether in the long run it will prove cost-effective, but it is clear that the rhetoric of improved convictions and reduced costs does not match the available statistics and data analysis.

Comparison of results with theoretical projections

Two journal articles on DNA potential, both from the US, are mentioned for purposes of contrasting their content with results from the present research. These articles are “The Unrealized Potential of DNA Testing” by Victor Weedn and John Hicks (1997) and “The Next Frontier of Law Enforcement: A Proposal for Complete DNA Databanks” by John Cronan (2000). These articles are critiqued from the perspective that, although they propose increased use of forensic DNA, neither relies on any quantitative data about the percentages of crime scenes at which DNA evidence was sampled during examinations by forensic investigators in the field.
In the former article, as the title suggests, the authors propose that more crimes can be solved by expanding the range of evidence collected, improving the speed of processing in laboratories and by utilising databases more effectively. They claim that,

Virtually all biological evidence found at crime scenes can be subjected to DNA testing. At most crime scenes, there are many kinds of biological evidence: not only blood and hair but also botanical, zoological and other types of substances…Hair was found at the scene of 10% of robberies and 6% of residential burglaries…Fingernail scrapings from an assault victim or a broken fingernail left at the scene by the perpetrator may also be useful DNA evidentiary specimens…The superficial skin cells that an individual sheds in the hundreds of thousands every hour may be prevalent at crime scenes (Weedn and Hicks, 1997: p. 17).

This optimistic assessment, however, fails to account for scientific, legal and crime scene examination realities. Nearly all shed hair found at crime scenes is in the anogen phase, that is, without roots, and according to the FBI Laboratory Division’s Senior Scientist, Dr Bruce Budowle, is not suitable for DNA analysis (Budowle, 2002; see also Prieto, Montesino, Salas, A. et al., 2003). Examinations for epithelial cells often did not meet quality assurance guidelines and were not yet accepted as court evidence (Grice, 2001) while Associate Professor Leo Freney, Queensland’s Forensic Laboratory Manager, has discounted the feasibility of profiling DNA from dandruff (Freney, 2002).

However, as technology improves, the use of such techniques as Low Copy Number (LCN) DNA, mitochondrial DNA, epithelial cells and “handy” DNA is likely to increase (Werrett, 2000: 22-24; Orr-Munro, 2001: 22-23). Comparison of data on collection levels of DNA evidence to date, at burglaries and car thefts in the UK, Queensland and New Zealand, are consistent, and corroborate that maximum rates are only around five percent and average rates three percent (Blakey, 2000a: 18-21; Shanahan, 2002; Walsh et al., 2002: 212). This collection rate found in practice
directly contradicts Weedn and Hicks’s claim that “At most crime scenes, there are many kinds of biological evidence”.

Tracy and Morgan also drew attention to inherent practical difficulties in the proposals by Weedn and Hicks:

It is highly unlikely that police departments have sufficient resources to look for such evidence across the wealth of crimes with which they must concern themselves…Imagine trying to convince police to search the crime scene (usually outside) of a robbery for such evidence as a perpetrator’s hair, tissue or other biological residue. Or imagine further, a crowded parking lot outside a bar or nightclub that was the scene of an assault. Here the police would be expected to hunt for a broken fingernail or the victim would have to turn over his or her clothing so that a search for trace evidence could be conducted (Tracy and Morgan 2000: 654).

This assessment coincides with quantitative data reproduced earlier in this chapter, indicating that DNA evidence from fewer than two percent of serious assault cases were referred to the laboratory. Many such cases were thoroughly investigated by scenes of crime or scientific officers after being assessed by trained investigators. In terms of the proportion of crime scenes that yield DNA, the findings of the present research largely supports the assessment made by Tracy and Morgan as summarised in the literature review in Chapter 3. Their assessment in relation to serious crime, that a large proportion is solved and that DNA databases can make little difference to solution rates, would appear to be confirmed by the primary data analysed. A counter-argument to this statistical perspective is that a number of serious crimes, like murders and rapes that would otherwise have remained open, have been solved through DNA (Gunn, 2001: 26).
Since Tracy and Morgan’s (2000) research in Texas, the strategic and proactive management of forensic evidence results as a primary investigative medium, has been implemented through systems such as FLINTS and through police Operations like Vendas. Their opinion of DNA’s poor performance in the US may not have been improved by results from the local Texas DNA database, which had recorded only four “cold hits” at the time of their research (2000: 680). The low levels of convictions from early “cold hits” in New York and Oregon were discussed in Chapter 8.

The proposal by Cronan for promoting universal databanks for storing the DNA of all citizens as a means towards eradicating crime, mentioned earlier in Chapter 1, exemplifies the extreme usage of DNA databases. Cronan sought to justify this schema through the supposed benefits by way of increased convictions, reduced costs, deterrence and reduction of wrongful convictions. A critical examination of this proposal is informative, as it incorporates many of the common myths and hyperbole associated with forensic DNA. However, it relies on false premises, with the author displaying a lack of experiential knowledge about the quantitative availability of DNA evidence at crime scenes. As quoted previously in Chapter 1:

> If implemented, complete DNA databanks would spur unprecedented law enforcement benefits. Rates of convictions for violent and sex-related crimes would explode, while erroneous detentions and convictions for crimes with DNA evidence would plummet. At the same time, investigations would proceed expeditiously, thereby slashing many law enforcement expenses. Moreover, the mere existence of such databanks likely would trigger enormous deterrence that would lower the crime rate (Cronan, 2000: 122).

The conclusion of the present research based on actual case studies of the most recent police and laboratory practices, as illustrated in Table 9.1, indicates that DNA could be used in around two percent of sexual and in fewer serious assaults, rendering any “explosion” in conviction rates highly implausible. Further problems with Cronan’s proposal include astronomical costs and potentially significant erosions of privacy and
civil liberties as discussed in the following chapter. The issue of deterrence is addressed in the next section.

**Deterrence and forensic DNA**

Deterrence occurs when individuals resist offending through fear of apprehension. Some schools of criminological thought, such as classical theory and some rational choice theorists, suggest that increasing the risk of apprehension will cause corresponding reductions on criminal activity by deterring potential offenders. Raising the probability of apprehension is seen by some criminologists as a means to suppress many types of crime (Nagin and Pogarsky, 2003; Koper, 1995; Paternoster, 1989; Sampson and Cohen, 1988). As noted earlier in this chapter, deterrence functions in both a specific and a general manner.

The potential for deterrence has been adopted in promoting the use of forensic DNA, and as one of the rationales behind such police operations as Vendas. It was noted in Chapter 8 how the CrimTrac *Business Case* for the national DNA database factored in savings through crime reduction which “derives from the deterrence effect as well as the intelligence information derived from the use of the national DNA system, resulting in a reduction in volume crime” (Nearhos and Bowman, 1999: 69). The principle of deterrence and its projected benefits were cited in justifying legislation that provided for extensive DNA sampling in Queensland (Green, 2000: 10).

On DNA’s potential for specific deterrence in relation to serious offences against the person, Professor Ian Freckelton of the Department of Forensic Medicine at Monash University submitted an expert opinion to the Victorian Parliament’s Law Reform Committee’s inquiry into forensic DNA:

> The deterrent effect of the increasing reliability and resort by investigators to DNA profiling is also unclear. Relatively few violent offenders, either those employing overt violence to assault physically their victims or to sexually assault their victims, are likely to be discouraged from their conduct by the potential for body
tissues to be found by DNA profiling. Criminal offending of these kinds is rarely so premeditated or reasoned. Ironically, such a realisation has the potential to induce further violence on rare occasions to hide the crime and the likelihood for its being discovered (Freckelton, 2003: 27).

Although this suggests that violence, or crimes against the person, are unlikely to be reduced through deterrence from DNA, property offences are another issue. One argument against any specific or general deterrent effect on property crimes is that is potential offenders who are able to anticipate apprehension through DNA, but are still motivated to offend, would be equally likely to take precautions against leaving any trace DNA evidence.

Another argument against DNA acting as a deterrent derives from studies of burglar behaviour. Richard Wright and Scott Decker (1994) conducted a detailed investigation of burglar behaviour by observing and interviewing 105 practising burglars. The study was conducted in St. Louis, Missouri, then a declining “rust belt” city with a burglary rate more than twice the national rate, with 69% of the offenders being black (Wright and Decker, 1994: 7, 10). As forensic DNA was not widely used at the time of their research, they were questioned for this thesis as to whether they had observed burglars taking any precautions in relation to leaving fingerprints. Their response was that burglars were more focussed on the immediate circumstances of their crime: whether people were at home, if dogs were on premises, the presence of witnesses, means of entry and so forth. “Certainly some of the offenders in our study did take precautions such as wearing gloves, but by far the majority did not” (Wright, 2002). This finding coincided with that of more recent Australian PhD research, which found that burglars tended to act in response to cues in their immediate spatial and temporal environment (Macintyre, 2001: 302-309), rather than in anticipation of consequences from leaving trace forensic evidence.
In response to an inquiry on this issue, Professor Scott Decker replied:

Recall that in large part, the members of our sample were recruited from street samples of offenders. By and large, these offenders were not terribly sophisticated and engaged in limited planning of their offences. That limited planning extended to getting in, finding goods and making their escape. My recollection is that a number of the burglars did indeed wear gloves during their burglaries, but that was largely to effect the entry into the house. Thus when windows were to be broken, doors to be jimmied or pushed in, gloves were seen as useful providing some safety in the task. One offender in particular wore the kind of leather gloves that you would wear in the winter to keep your hands warm as they afforded extra protection. A few talked about not leaving fingerprints, but concerns about other physical evidence provided by trace DNA was probably the farthest thing from any of their minds (Decker, 2002).

For both serious crime and property offences, this would suggest that any specific deterrent effects of forensic DNA on offenders would be very low. Because general deterrence is a function that relates to the certainty of apprehension, it can be argued that the low conviction rate for reported burglaries through DNA, of less than two percent at best (from Chapter 8), would provide little disincentive. However, the perception of the risk of apprehension by potential offenders may be different from the reality. Two publications that included deterrence as an attribute of forensic DNA (Nearhos and Bowman, 1999: 69; Green, 2000: 10) did not cite any sources in support of this opinion. Rather than speculation, a survey of offenders, or other recognised research method, may need to be employed to gauge the general deterrent effects, if any.
CONCLUSION

This chapter assessed the value of forensic DNA evidence in the justice process against the objectives of the criminal justice system, which were defined. It then used data collected during the research for Chapters 4 to 7 to examine the proportion of court cases in which DNA was used for four main offence categories. This approach was taken on the basis that the impact of DNA would be positively related to the number of cases in which it was employed. The effects and influence of DNA on decisions by prosecutors, defendants and juries in the categories of offences where it is most commonly used was summarised, based on findings from Part B of this thesis. As the main focus of this research was the effects of DNA on crime, no structured study of benefits-costs in relation to DNA was made. However, the evidence that was examined about DNA costs for investigations was inconclusive. On one hand, in sexual offences for example, DNA may provide leads that shorten investigations and thereby reduce costs; while for other offences, scenarios will arise where it could be associated with numerous false leads and increased costs. The control-comparison methods used in Chapters 4 to 6 did indicate that for serious crimes no savings could be expected through increases in numbers of guilty pleas. For property crimes, though, a highly significant association was found between DNA evidence and guilty pleas. However, because such cases are a small minority and lead to cautions or to hearings in the lower courts, often with defendants charged with numerous other non-DNA related offences, expected cost savings might not be significant. Any potential savings to courts are also likely to be outweighed by delays caused by processing of volume crimes in the laboratory.

The chapter discussed theoretical proposals by Hicks and Weedn (1997) for more much extensive use of forensic DNA and argued against these based on the proportion of crime scenes from which trace DNA was actually recovered. Cronan’s (2000) concept of all citizens’ DNA being registered on databases was also analysed, but rejected on the purely pragmatic grounds that DNA was simply not found at enough crime scenes to justify the effort and cost, nor was the concept capable in the
foreseeable future of producing the benefits promised. Last, miscellaneous issues of
deterrence, eliminations of suspects and exonerations after trial were discussed.
CHAPTER 10: PRIVACY AND CIVIL LIBERTIES

INTRODUCTION

This chapter digresses from the empirical approach employed so far in this thesis to examine issues of individual privacy and civil liberties in relation to DNA profiling and criminal databases. Although DNA databases are maintained for medical reasons and by some military for the identification of unknown soldiers who die in combat (Leary, 1992), this chapter principally discusses databases kept for criminal investigation purposes. Criminal investigation DNA databases are recognised as a form of surveillance that societies can employ to assist in controlling illegal or anti-social acts. However, the social need for police investigations has to be balanced against citizens’ rights to privacy. Part 1 discusses a number of issues related to achieving this balance: the individual’s entitlement to privacy in a liberal democracy; the application of genetic information by eugenicists in the past to manipulate immigration laws and to sterilize prisoners and the intellectually impaired; the willingness of insurance companies and employers in the 1970s to use non-forensic genetic information to discriminate against sickle cell carriers; the interest in a “criminal gene”, starting with the studies a century ago of degenerate families like the mythical “Kallikaks”, through to the interest in the XYY karyotype carriers during the 1970s, and to the possibility of research using samples from forensic databanks with the aim of linking genetic makeup to criminal behaviour. This section on privacy then weighs the relative merits of storing biological samples as against compiling computerised DNA profiles for criminal identification purposes. It concludes that after profiles are extracted, there is no necessity to retain samples, and that to do so has potential to infringe privacy. The final issue addressed in Part 1 is: Since we are constantly depositing trace DNA, perhaps our DNA is not really private at all.
Part 2 of the chapter is concerned with civil liberties and DNA profiling. The chapter examines issues including whether providing a DNA sample to police is a form of self-incrimination; how DNA evidence can exclude persons as suspects; how it has acted to assist in overturning or reversing the convictions of numerous innocent persons; the repercussions of wrongful convictions based on DNA evidence; and whether DNA mass testings contravene civil rights both through effectively reversing the onus of proof and through “request surveillance”. The civil rights of victims of crime are also discussed. Following this, concerns about thousands of samples that were kept illegally on the UK DNA database are addressed, as is the overseeing of DNA databases by independent bodies, and the possibility of “planting” DNA evidence. A number of issues, however, are considered beyond the scope of the present chapter, although they do impact on civil liberties concerns by affecting court outcomes. These issues are largely addressed in the literature for the disciplines of law, molecular biology and psychology. They include the presentation of DNA evidence by forensic scientists as expert witnesses; the statistical methods used to calculate match probabilities; prosecutor and defence fallacies in applying these probabilities; and the effect on jurors’ decisions by the manner in which DNA evidence is presented.

SECTION 1: PRIVACY ISSUES

A core concept of privacy is the notion that individuals should be in control of what information about themselves should be made available to others (Redmayne, 1998: 438). The notion that governments should respect individual privacy is recognised in Article 17.1 of the International Covenant on Civil and Political Rights, which states, “No one shall be subjected to arbitrary or unlawful interference with his privacy, family, home or correspondence…” (United Nations, 1966: 7). Australia is a party to this covenant. A sample of a person’s DNA contains their unique genetic blueprint, and may reveal information about them that could be used to predict future events, such as their susceptibility to some diseases. As mentioned in Chapter 1, an extreme fictional version of the unfettered use of DNA profiling was portrayed in the movie GATTACA (1997), which provoked anxieties about genetic manipulation, scientific enslavement and loss of individual choice and freedom.
The concern that forensic DNA might be used to predict disease has been accentuated by the finding that one of the DNA markers used for identification in the UK, the TH01 marker, can reveal whether a person has a predisposition to diabetes. According to Professor Sir Alec Jeffreys, developer of DNA profiling and a member of the team that made the finding, “this marker is weakly linked to a shift in your predisposition to diabetes and the police should not be collecting that type of information” (quoted in Concar, 2001a: 9). Jeffreys believes it possible that other forensic markers could also be linked to medical conditions or traits. Although Australia’s ProfilerPlus system does not utilise the TH01 as an identification locus, it is sometimes used in Queensland in the AmpF/STR Cofiler PCR Amplification Kit, commonly called the “Cofiler” (Davies, 1999: 43; Freney, 2003). DNA samples containing the entire genome of individuals are usually retained in this country by forensic laboratories (Keays, 2000: 11), as legislation requires their destruction only under specified conditions. Under Queensland legislation introduced in 2000, a person’s sample was to be destroyed “within a reasonably practicable time after the end of 1 year” if their arrest was discontinued, if the charge against them was discontinued or if they were found not guilty in court (s 318H Police Powers and Responsibilities Act, 2000).

**Historical background: use and misuse of genetic data.**

A concern expressed in relation to DNA databases is their potential for misuse based on earlier experiences with genetic data. The 20th century offers examples of efforts by the eugenics movement, founded by Fingerprint Science pioneer Sir Francis Galton, towards genetic “guidance” and “improvement”. It was believed this would be achieved both by selective breeding and by the prevention of reproduction. The movement produced purportedly scientific studies in order to implement their objectives through legislation. In the US, one of their notable achievements was the Immigration Act of 1924, which defined a quota system of entry favouring those from northern and western Europe. This was justified by a 1923 study claiming that south-eastern Europeans and Russians were over-represented in state asylums and sanatoriums (Ludmerer, 1972). The movement’s other major success was the involuntary sterilisation of the intellectually impaired, of the mentally ill, and of some convicted criminals. Between 1907 and 1959 at least 60,000
persons in the US were involuntarily sterilised. As late as 1950, a parole program at San Quentin Prison included inmates having to consent to sterilization as a condition of release (Reilly, 1992: 227).

Although eugenics largely fell into disfavour after World War II, due to the misuse of its theories by the Nazis to justify the Holocaust (Stein, 1988: 50-58), it re-emerged in Singapore in 1985, where an openly eugenic policy was adopted. Female university graduates were guaranteed pay increases upon giving birth to a child, while non-graduate married women were offered housing grants if sterilized after their first or second child (Chan, 1985: 707-712).

Two genetic testing programs in the early 1970s, involving sickle cell carriers and the XYY syndrome, exemplify possible consequences if widespread DNA testing were conducted and the results publicly available. Sickle cell disease is a group of inherited blood disorders, which, in the United States, is predominantly found among Afro-Americans. If a person carries two sickle cell haemoglobin-producing genes, they will have sickle cell disease and its symptoms, such as anaemia, pain and strokes. If a person carries only one sickle producing gene, and one normal haemoglobin gene, they will have sickle cell trait, a condition that carries no symptoms (Sickle Cell Information Center, 2004: 2).

In the US in the 1970s, about one-third of the States instigated programs to identify persons carrying the sickle cell trait. One outcome was the discrimination against those asymptomatic carriers by insurers and employers that required corrective Federal legislation. In the period following the initiation of the testing, sickle cell carrying airline employees with the trait were reportedly grounded, because of unproven fears that they would undergo a sickle cell crisis if an aircraft depressurised. Other sickle cell carriers found that insurers were planning to increase their premiums, despite having no actuarial data to justify such a decision. It was also revealed that the military, a large-scale employer of Afro-Americans, had planned to defer the signing up of carriers (Reilly, 1977; Duster, 1990).
Around the time of the sickle cell issue, it was discovered that persons with the 47, XYY karyotype (the character of the cell nucleus as determined by nature of all chromosomes) were disproportionately over-represented in prisons and in mental institutions. A program conceived to monitor a large cohort of such XYY syndrome persons from birth sparked heated debate. Because of the implications for justice, particularly for the insanity defence, the Law Enforcement Assistance Administration quickly funded XYY research, partly to ascertain if those with the carrier type showed any predisposition towards criminal behaviour. Both the sickle cell and the XYY programs were hampered by poorly drafted laws, under-funding and an inadequate provision for counselling. Amid intense political pressure, investigators abandoned these projects (Reilly, 1977, 1992).

These experiences indicate that genetic tests which target persons whose risk factors may be higher than average for such conditions as heart disease, cancer or other major killers, will be much sought after for identification by employers and insurers. Such concerns are relevant to contemporary Australia. The New South Wales Genetics Education Program national survey reported over 100 cases of discrimination by insurance companies against families with genetic disorders (Metherell and Smith, 2000). Another Australian study found genetic discrimination with respect to a wide range of genetic tests by insurers, employers and health services providers (Barlow-Stewart and Keays, 2001). In 2004, it was still not illegal in Australia for companies to use the results of genetic testing in calculating premiums. Examples of discriminatory practices included increased premiums for life, income, travel and superannuation insurance (Mould, 2003: 470-487).

The genetic based discrimination by insurance companies may well contravene Article 6 of the *Universal Declaration on Human Rights and the Human Genome* which states that “no one shall be subjected to discrimination based on genetic characteristics that is intended to infringe or has the effect of infringing human rights, fundamental freedoms or human dignity” (UNESCO, 1999). In other jurisdictions like the US State of Texas, the use of genetic data by insurance companies for illegitimate purposes is explicitly prohibited (Tracy and Morgan, 2000: 673). The only legislative attempt, albeit
unsuccessful, to remedy this situation in Australia was the listing of a now defunct private members Bill, the *Genetic Privacy and Non-discrimination Bill 1998*, by Australian Democrat, Senator Natasha Stott Despoja. The concerns raised by the retention of forensic person samples are of a leakage of forensic genetic data if coding sequences were used, the re-testing of forensic samples for experimental or for non-forensic purposes, or using forensic data as a disease predictor – as the TH01 marker may be for diabetes in the UK.

**Genetic links to criminal behaviour: the search for a “criminal gene”**

One concern with DNA databases or databanks is that information or samples they contain could be allowed by legislation to be used at some future time as a basis for research on genetic links to crime (Webb and Tranter, 2001: 168), or by drug and biotechnology companies as a source of genetic material (Keays, 2000: 11). Already private industry has applied pressure to access DNA databases. By 2001, amid much public controversy, the genetic database of the entire population of Iceland had been sold to a private company. In Britain, a representative of the drug companies approached a panel of medical and industry experts, formed by the Health Secretary, with a similar proposal. According to minutes from a panel meeting, Crispin Kirman, chief executive of the Bioindustry Association warned that unless the industry was allowed to use National Health Service DNA data, Britain would become “a third world genetics country” (Barnett and Hinsliff, 2001). If similar pressure were applied to access forensic DNA databases, lobby groups acting for those with criminal samples would be unlikely to carry much political influence to counter such pressure.

The Privacy Commission of Canada had considered this genetic research issue some years earlier, noting a potential tendency for such research and its possible consequences:

> Scientific curiosity and public pressure to reduce crime will almost certainly lead to interest in using samples of convicted offenders to look for common genetic traits that may be linked to anti-social behaviour. This could lead to the unwarranted labelling and mistreatment of
individuals, and their law-abiding biological relatives, as deviant because of their genetic makeup (Privacy Commission of Canada, 1995).

The concept of a “criminal gene” has received attention since biological theories of crime were popularised around a century ago. Mythological families or “tribes”, like the Kallikaks, Jukes or Happy Hickories, were studied through ancestral generations using court and medical records and through interviews with elderly neighbours (Goddard, 1912; Rafter, 1988). Evidence of recurrent social problems in these “tribes” – such as criminality, feeble-mindedness, poverty, alcoholism or promiscuity – supposedly confirmed a genetic relationship that stemmed from “transmitting the evil protoplasm through the generations” (Rafter, 1990: 74). These studies provided impetus to the sterilisation movement with its aim of preventing the breeding of future generations of such groups, particularly as it was believed that they were reproducing at a faster rate than the more educated classes.

Despite the debunking of such biological positivism in the second half of the 20th century, schools of scientific thought attempting to link biology to human behaviour have remained strong, though in more subtle ways (Eysenck, 1976: Wilson and Herrnstein, 1985; Denno and Andrews, 2000: 21-22). On the other hand, many scientists have disparaged the notion of identifying a criminal gene by current forensic testing systems like the ProfilerPlus, as these systems test the non-coding or “junk” regions of the DNA, which perform no known function. If DNA samples held for forensic purposes were misappropriated for such experimental purposes, the coding regions or genes that allow cells to create a protein product would have to be tested. Variations would need to be detected in the sequences of specific normal genes that might produce a different amino acid, and this may affect proteins, which in turn can affect the host (Klinteberg, 1996: 146-54).

In relation to criminal activity, because human behaviour is so complex and so inextricably interwoven with environmental factors, multiple genes are likely to be involved; so it may not be possible to attribute specific behavioural patterns to any one
gene (McGuffin, Riley and Plomin, 2001: 1232-49). Further, crime itself is a socially
defined phenomenon, which distances it from genetic causes, although there is strong
public opinion support for most crimes being “crimes” (United States Sentencing
Commission, 1997). Although this debate remains unresolved, the Human Genome
Project nevertheless contains information on “Behavioural Genetics” (Human Genome
Project online, 2003).

Justice Michael Kirby has commented on the search for a “criminal gene” in a similar
vein to the legal position taken on the XYY karyotype:

The criminal law is built upon a general hypothesis of free will. For the
crime to be established it is normally necessary to prove both the act of the
accused (*actus reus*) and the will (*mens rea*) occasioning that act. But
what are the implications for the law of discovering that, in some cases at
least, for some people, the act is practically nothing but the product of a
genetic characteristic? (Kirby, 2000a).

If legislation did allow future research to try to identify criminal tendencies using
forensic samples, it would violate the “specific use” principle, that DNA samples only be
used for the purpose for which they were acquired. This principle has been advocated by
a number of organizations and commentators including the Council for Responsible
Genetics in the US (Redmayne, 1998: 440; Annas, 1993: 2349; Wilker, Stawski,
Lewontin and Billings 1992: 147).

**Databases vs. databanks**

An important privacy concern with DNA samples is whether they are stored as a bank of
samples (databanks) or as profiles in a computer memory (databases). In New Zealand,
whose criminal DNA database began operations in 1996, legislation under sections 60 to
63 of the *Criminal Investigations (Blood Samples) Act, 1995* requires that the samples be
destroyed. Several European countries followed a similar course, but Australian
jurisdictions did not enact such provisions, except under specific conditions, such as
when a person was found not guilty of the offence for which DNA was sampled. This situation has been criticised on the grounds that DNA samples contain the entire genetic blueprint of an individual and that “storing DNA samples is unnecessary and highly invasive” (Keays, 2000: 11). Around 99.9% of a person’s DNA is the same as that of every other person, but some areas of the molecule vary significantly between individuals. This non-coding or “junk” DNA does not code for any personal characteristics. Because it is highly variable it is ideal for forensic purposes (Schneider, 1997: 17-22). The courts have recognised this, as did the Queensland Court of Appeal in *R. v. Fitzherbert*:

A small part of the DNA “codes for” – i.e. determines the composition of – molecules from which the body is made up; but most of it is “junk DNA”, which may have some function but does not appear to “code for” any bodily molecules. It is this “junk DNA” on which the profiling is done and the reason for that is that such DNA can be quite variable from person to person, whereas the “coding” DNA is extremely similar from person to person. To put this another way, the “junk DNA” is profiled because it is distinctive of a particular individual. ([2000] QCA 255 at [7]).

Future technology may render this opinion obsolete. If research projects (see Chapter 2 and QUT, 2000: 1) that aim to discern characteristics of offenders, like red hair or blue eyes, from residual DNA at crime scenes succeed, areas of the molecule other than the “junk” regions may be analysed (Office of the Victorian Privacy Commissioner, 2002: 2).

Medical analysis of DNA samples, as distinct from forensic analysis, may reveal genetic predispositions to a wide range of conditions: inherited bowel cancer, haemochromatosis, familial melanoma, Alzheimer’s and Huntington’s diseases, hyperlipidemia (Barlow-Stewart and Keays, 2001: 250) and possibly the likelihood of some behavioural disorders like depression, alcoholism or suicide. The discovery of the BCRA1 gene in chromosome 17, for example, means that certain women can learn that they may have an
85% likelihood of developing breast or ovarian cancer. A person’s DNA also contains information about the DNA of their parents, brothers, sisters, cousins, their children, grandchildren and other blood relatives. As was noted above, if this genetic information were leaked or became available to government departments, insurance companies or employers, it could potentially be used to discriminate against individuals directly, or indirectly by favouring certain people and thereby excluding others.

Legal researcher and molecular biologist David Keays labels the counter-argument – that scientists need to keep samples to check results – as a “furphy”, pointing out that to check a profile, another sample can be taken from the suspect, who, if available for court, will also be available for sampling purposes (Keays, 2000: 11). Database profiles are used for police intelligence purposes, but for court, the profile of another sample taken on arrest for the offence being heard, is presented in evidence. This constitutes a second confirmatory analysis on the profile, and also avoids prejudicing the court hearing by revealing that the defendant previously had DNA recorded (Blakey, 2000a: 12).

In the UK, the Royal Commission on Criminal Justice addressed the issue of database security by suggesting that an independent body should oversee national forensic databases (1993: 16), but that recommendation was never implemented. In Queensland, an indirect form of regulatory monitoring exists. Although police officers swab suspects for DNA, the samples are forwarded to the Health Department’s forensic biology laboratory. The laboratory and the QPS DNA Unit both comply with National Association of Testing Authorities, Australia (NATA) guidelines and accreditation requirements, and undergo inspection by NATA assessors. As a government entity, the laboratory’s work can be subject to scrutiny, and its scientists are ultimately monitored by Queensland’s Crime and Misconduct Commission (CMC), as occurred in the Button case (*R. v. Frank Alan Button* [2001] QCA 133; Crime and Misconduct Commission, 2002).

**Guthrie cards**

An unplanned collection of the DNA of every Australian born after 1970, which has been a source of controversy, exists in the form of Guthrie cards. Most Western countries are
in a similar position. These cards contain blood samples taken from every baby by means of a heel prick, to check for cystic fibrosis, phenylketonuria and congenital hypothyroidism. In one instance in Western Australia, police accessed these cards without consent. Detective Sergeant Gary Fraser obtained a search warrant for the Perth hospital, later commenting: “This is the worst case that I have been involved in – involving incestuous behaviour – very extremely tragic where the father targeted his own biological daughters and there’s actually been children fathered by the biological father” (Australian Broadcasting Commission, 2003). Detective Fraser wanted DNA samples to prove the man was father to his own grandchildren, but no one in the family would consent, as the family, especially the daughters, lived in fear of the man. Having obtained the DNA samples from the Guthrie cards, Detective Fraser successfully prosecuted the offender, breaking the cycle of incest.

Following these events, the Perth hospital made the controversial decision to destroy the Guthrie card databank, retaining cards for only two years after birth. An argument for retention of the cards on medical grounds was provided by Sydney resident, Michael Easton, whose brother died of cystic fibrosis. When Easton wished to marry, he was unsure if he carried the fatal genetic mutation, which he did not wish to pass on to his own children. Doctors retrieved a sample from the deceased brother’s Guthrie card, and after testing, were able to assure Easton that he did not carry the gene. However, had he lived in Western Australia there would have been no Guthrie card to test. (Australian Broadcasting Commission, 2003; Office of the Victorian Privacy Commissioner, 2002: 36; see also McEwan and Reilly, 1994, 196-200; and Lawson and Smith, 2001: 215-223).

**Covert collection: Is our DNA really private?**

A legal precedent relevant to privacy and DNA evidence is case law from the *ratio decidendi* in *R. v. Carr* in relation to fingerprints. In that case it was held that fingerprints were not private, as a person may leave them wherever they go (*Regina v. Carr, unpublished decision of the Court of Criminal Appeal N.S.W., No. 45 of 1972*). A similar argument could be applied to a person’s DNA, although in the US an analogy has been drawn to throwing out refuse:
Sergeant Michael Puetz of the St. Petersburg, Florida, police in October 1998 tailed a man named Charles C. Peterson. Peterson, 39, allegedly matched the description of the “Duck Robber” (named for his distinctive toe-out waddle) suspected of 15 robberies and a double rape. He was driving his motorcycle, tailed by Puetz in an unmarked car, when he stopped at a light, turned his head – and spat. Puetz grabbed a paper towel and sopped up the evidence. A few days later, a lab reported a match with semen from the rape, and Peterson was arrested…. Puetz defends the constitutionality of his evidence-gathering methods; the courts, he says, have held that once you put out the trash, you’ve waived your rights to keep the contents private, and “I don’t see why the same won’t hold true for saliva” (Adler and McCormick, 1998: 31).

A similarly lawful gathering of DNA occurred in a Florida investigation, where DNA was obtained in a rape-murder of a 23-year-old cocktail waitress, Laurie Colannino. Police combed the garbage of one neighbour who refused to provide a saliva sample and obtained matching DNA from cigarette butts. During the investigation, the police also requested the man’s twin brother to provide DNA, and searched the brother’s rubbish (Thompson, 2001). Jeremy Gans (2003), a Senior Lecturer in Law at the University of Melbourne, contends that, given police powers for compulsory sampling, such techniques should not be condoned. He argues that they are invasive of an individual’s legitimate expectations for privacy: the freedom to blow their nose, to spit and to drink without incriminating themselves (Gans 2003: 3, 7). Two issues arising from the above vignettes. First, Australian legislation in 2004 applied only to samples from crime scenes and samples taken from persons aware they are being sampled – those in custody, for example. The second issue is the use of a suspect’s relatives for sampling purposes. Both these issues will be discussed in Chapter 11.
SECTION 2: CIVIL LIBERTIES ISSUES

DNA sampling, self-incrimination and privacy

Under common law, a person is not obliged without good cause and authority of law to answer questions or to make statements that will incriminate them. This “right to silence” principle is also enshrined in Article 14.2 of the International Covenant on Civil and Political Rights to which Australia is a signatory. Some legal commentators have argued that extensions to police powers that allow the taking of DNA samples are forcing people to incriminate themselves (Gelowitz, 1989; Walker and Cram, 1990). Maintaining silence during either the investigation or trial phase, however, has progressively come to be associated with guilt, and is rarely exercised because it is difficult to maintain and may result in adverse outcomes (Dixon, 1995). The right has also been eroded in the UK by the Criminal Justice and Public Order Act 1994 (UK), while in Australia, following the High Court decision in Weissensteiner v. The Queen [178 CLR 217], an accused may be obliged to explain facts peculiarly within their knowledge (Hocking, McCallum, Smith and Butler, 1997: 209).

In Australia in the early 21st century, mouth swabbing of arrested persons for DNA became a routine procedure under the various State and Territory laws enacted in 2000. Considerable public discussion was generated about the DNA sampling, consent and privacy issues following the SBS television program Insight broadcast on 31 May 2001. The program showed an inmate at Bendigo Prison in Victoria being held down by three officers in riot uniforms whilst a sample of blood was taken using force by another person in the presence of an additional five officers and a police dog. In total – apart from the inmate and the person who took the sample – there were eight officers present (both prison and police officers) and a police dog.
A Victorian Privacy Commissioner’s submission later noted that privacy was “not simply about the data extracted at present from DNA samples and held by CrimTrac. It is also about the fundamental issues of when the law should permit DNA samples to be extracted from people and used” (OVPC, 2002: 2). The submission identified how taking samples impinged upon privacy, conceding that some instances could be authorised by law. These instances included interference with personal liberty, such as when a person was arrested for a court-ordered DNA test; interference with bodily integrity, such as when blood was drawn or hair was plucked, and the collection, use and retention of genetic information (OVPC, 2002: 2). Approaches to these issues are discussed in the following chapter under the heading “Statute law”.

Within a decade, perceptions of what are acceptable investigative practices have changed or have been changed through legislation. This change reflects similar changes that occurred historically with the taking of fingerprints. When fingerprinting was first introduced in the United States, many courts declared that it was an intolerable violation of civil rights (Wilson, 1989: 123), yet today it is an unproblematic procedure. Cole (2003) has examined in more detail the potential influence that fingerprint identification might have on forensic DNA use. The present predominant judicial argument is that the self-incrimination privilege applies only to testimonial, rather than to “real” evidence, and that it does not apply to incriminating aspects of a suspect’s body (Easton, 1991: 18-29).

**Exonerating the innocent through DNA profiling**

An apparent irony for those objecting to DNA sampling is that DNA evidence has been used in numerous cases worldwide to eliminate possible suspects during criminal investigations, and to exonerate the innocent after trial. In a number of early cases involving DNA evidence, the science of DNA profiling was put under scrutiny by the legal system. In more recent years, the fallibility of the legal system has become apparent from cases where DNA evidence has acted as a “justice tool” to help reconstruct crimes more accurately and reveal flawed decisions made by criminal courts (Connors, Lundregan et al., 1996).
As was discussed in Chapter 2, the first time DNA profiling was used for forensic purposes, Rodney Buckland, who had confessed to the rape and murder of one of two teenage girls in Narborough Village, was excluded as a suspect through the technique (Wambaugh, 1989). In primary research for this thesis outlined in Chapter 9, it was found that DNA testing was used in two (2.4%) of 85 cases to exclude persons as suspects. This proportion differed significantly from findings in the United States, where between 25% and 33% of suspects are routinely excluded through DNA testing (Miller, 1991: 12; Wasserman et al. 2000: 3). Forensic scientists in Australia are well aware of the differences in these exclusion rates (Grice, 2000). Despite these variations, DNA testing is used internationally to assist in targeting police investigations and, according to Chief Constable Ben Gunn of the Cambridgeshire Constabulary, by eliminating suspects, “it has shortened some major crime investigations, and reduced the financial cost and human suffering in those cases” (Gunn, 1998).

DNA testing has also proved valuable after trial. By March 2004, more than 140 convictions in the United States had been reversed or overturned as a result of DNA evidence (McMurtrie, 2004). The overturning of most of the convictions in the US was a result of the various Innocence Projects, the original being at the Cardozo Law School, Yeshiva University, New York (Innocence Project, 2003). (These cases are summarised online at http://www.innocenceproject.org). David Lazer of the John F. Kennedy School of Government at Harvard University has drawn attention to an anomaly with these cases:

Strikingly, while increased statutory rights to convicts to access to DNA has facilitated post-conviction review, none of the exonerations to date are the result of either a State-run or DA-run program (Lazer, 2003: 4).

Although earlier studies have examined convictions of the innocent (Borchard, 1932; Bedau and Radelet, 1992), these DNA cases have provided an unprecedented opportunity to scrutinise the American criminal justice system, and have acted as a catalyst for research on that topic (see for example, Freedman, Leahy and Neufeld, 2001: 1085-1299;
and Westervelt and Humphrey, 2001). By changing procedures in the justice process where problems are pinpointed, overall improvements can be effected that include non-DNA cases.

The leading causes of wrongful convictions in the US have been nominated as “mistaken eyewitness identification, coerced confessions, unreliable forensic laboratory work, law enforcement misconduct, and ineffective representation of counsel, singly and often in combination” (Neufeld and Scheck in Connors, Lundregan et al. 1996: xxx). In one study of these wrongful convictions, mistaken eyewitness identification was found to be a factor in 84% of cases, and another factor was police-induced false confessions during interrogations. That study also confirmed the fallibility of human memory and the willingness of jurors to accept testimony from mistaken eyewitnesses. Social scientists and psychologists consequently suggested reforms in procedures for eyewitness identification and for removing suggestive-style interviews with children, (McMurtrie, 2004). As a result of such studies, the State of New Jersey changed its procedure for the conduct of photo line-ups (Lazer, 2003: 4).

Cognitive psychological studies have recommended “double blind” identification parades, where neither the police officers conducting the parades, nor the witnesses, are given prior knowledge of which person is the suspect. In the alternative scenario, where police officers conducting the parades knew which person was the suspect, they tended to convey this, either consciously or not, to the witness. Typically this was done was by reinforcing the witness’ choice by using words to the effect of, “You picked the right one”. This led to later contamination of the witness evidence in the courtroom. The QPS “Guidelines for conducting identification parades”, issued in 2003 as Appendix 2.1 to the QPS Operational Procedures Manual, did not specify, nor suggest as an option, the use of this “double blind” provision (QPS, 2003b).
For photo board identifications (also known as photo ID boards, photo line-ups or photo galleries) about a dozen photographs are presented for a witness to view simultaneously. This procedure is conducted in Queensland as set out in sections 52-3, “Identification using photographs”, of Schedule 10 of the Responsibilities Code of the *Police Powers and Responsibilities Regulation* (PPRR) 2000. The psychological studies found more accurate outcomes resulted where witnesses viewed photographs consecutively. Research found that where witnesses were shown a photo board, they tended to select the photograph that most resembled the suspect, even if the suspect’s photograph were not present. On the other hand, witnesses were more likely to reject all images when shown the photographs consecutively, if the suspect’s image was not present (McMurtrie, 2004).

DNA evidence has overturned at least four Canadian cases where the innocent were wrongfully convicted (Walsh, 1999: 38; Windover, 2000: 1), and in one notable case in Australia, Frank Button was released from prison after a rape conviction was reversed because of DNA evidence (*R. v. Frank Alan Button* [2001] QCA 133; Crime and Misconduct Commission, 2002; Australian Broadcasting Commission 2002a; Dingle, 2001: 271-276). Following the American experience, innocence projects have been established in Australia at Griffith University at the Gold Coast (*Alternative Law Journal*, 2001: 259) and at the University of Technology in Sydney (Liverani, 2001: 26). The major limiting factor for innocence projects is the lack of availability of exhibits, which are rarely extant, from cases considered closed (Freney, 2003). In Queensland, the DPP returns exhibits to the QPS investigating officer two months after either the completion of an Appeal or the expiry date for lodgement of an Appeal for a case. QPS Procedures require either return of the exhibit to the owner, or its destruction (with the owner’s permission) “as soon as reasonably practicable”, in accord with section 423 of the *Police Powers and Responsibilities Act* (PPRA) 2000. In the UK, a standing commission, the Criminal Cases Review Commission, has been created to re-evaluate cases post-conviction (CCRC, 2004).
Due largely to DNA associated exonerations, “over two dozen different jurisdictions around the United States have enacted statutes to allow convicted prisoners access to DNA testing” (Swedlow, 2003: 1). This change was to remedy a lack of receptivity in the legal system to the post-conviction application of DNA analysis. Lazer (2003: 3) attributes this lack of receptivity to the high priority placed on achieving finality for cases, combined with the legal convention that evidence tends to “depreciate” over time – a principle that does not apply in a scientific sense to DNA. Legislatures in Australia might well consider the introduction of parallel post-conviction legislation. (See “Recommendations” next chapter).

Both Gregor Urbas (2002) and Amanda Dingle (2001: 271-276) have examined this issue. According to Urbas, a research analyst at the Australian Institute of Criminology, the introduction of new or fresh evidence into a criminal appeal is not a straightforward matter. Appeal courts are empowered under statutes in the various States to accept evidence only if it is considered “necessary or expedient in the interests of justice” (Urbas, 2002: 151). On the other hand, there is presently a general common law requirement that the evidence be “cogent” and “fresh”. The High Court of Australia, the nation’s highest appellate court, has no such power to receive fresh evidence in a criminal appeal, and may at present be prohibited from ruling on an appeal based on recently acquired DNA evidence (Urbas, 2002: 151-160; see also Dingle, 2001: 271-276).

**Wrongful convictions based on DNA**

The most serious blow to the credibility of DNA evidence has been the revelation of wrongful convictions attributed to incorrectly analysed or presented DNA evidence. One such conviction was overturned on 12 March 2003 following further DNA testing, and the event was given widespread publicity throughout the United States. In 1999, a 16-year-old defendant, Josiah Sutton, was found guilty of rape in Houston, Texas and sentenced to 25 years in prison. On a night in October 1998, two men abducted a woman at gunpoint from the parking lot of her apartment complex. She was driven in her car to an isolated spot where both men raped her. Five days later, she passed a group of men on the street and identified two of them to police as her attackers. Sutton was convicted
primarily on the basis of DNA profiling performed by the Houston Police Department’s crime laboratory, supplemented by questionable testimony from the victim. It took a jury just two hours to decide on his guilt. After later re-testing of the DNA, he was excluded as a suspect and freed after serving four years in prison (Anton, 2003; Hart, 2003; Liptak, 2003a; 2003b; Mabrey, 2003; National Public Radio, 19 March 2003).

In recounting the incident, Neal Conan of US National Public Radio commented, “Most people don’t argue the science behind DNA; the problems come in when humans misinterpret the data or lose the evidence or mix up the suspect’s DNA with somebody else’s” (2003: 1). According to the LA Times, “the Houston Police Department’s DNA lab was a mess. Analysts botched simple tests. They misinterpreted data. They stored evidence in a room where the ceiling leaked so badly that, one stormy night, 34 DNA samples were destroyed” (Hart, 2003: 19). There were also implications for the capital punishment debate in the US: seventeen of the cases on Death Row in Texas at the time awaiting execution involved defendants who were sent there based on DNA evidence from the Houston Police crime laboratory. Sutton was fortunate, in that a small piece of evidence was preserved that could be re-tested. Contrary to accepted practice, the Houston laboratory usually used up all samples with its initial tests, leaving nothing for scientists to test on behalf of the defence in the event of an appeal (Hart, 2003: 2; NPR, 2003: 2; Wecht, 2003: 1).

However, the incident may be indicative of wider systemic problems in forensic laboratories and with legal processes. Other reports regarded the Houston debacle as exemplifying the overwhelming backlogs, deficiencies of personnel, space and equipment that can lead to shoddy practices and erroneous test results (Wecht, 2003: 1). The Sutton case has drawn attention to issues that include laboratory accreditation, prosecution bias, refusal by judges to authorise payment for re-testing, mishandling of evidence and exaggerating its significance, the adequacy of funding for more personnel and equipment, autonomous administration of laboratories, shoddy record keeping and lack of training. The analyst who testified in the Sutton case admitted she had attended a
two-week training course sponsored by the company that sold DNA kits to her laboratory.

Sutton’s lawyer, Bob Wicoff commented, “This is an earthquake. The ramifications of this for other cases, for death penalty cases, is (sic) staggering. Thousands of cases were prosecuted on the basis of this lab’s work” (quoted in Liptak, 2003a: 1). The head of the legislative committee investigating problems at the laboratory, which was shut down in January 2003 following a review, stated, “People have lost confidence in the criminal justice system here…There are bound to be people who are innocent and in jail” (quoted in Hart, 2003: 1).

A further issue that has been raised as possibly leading to wrongful convictions is the mislabelling of DNA samples in laboratories. During public debate on DNA legislation, the President of the Australian Council of Civil Liberties, Terry O’Gorman, raised the question of “adequate safeguards against samples getting mixed up and against police planting genetic evidence”. He challenged, “No one on the police side wants to engage in that debate because they realise it’s their Achilles heel” (quoted in Griffith, 2000: 8). One of O’Gorman’s fears was realised in Las Vegas, where Lazaro Sotolusson spent a year in prison for three sexual assaults after his name was mistakenly placed on another man’s DNA profile at the police forensics laboratory (Puit, 2002: 1B). A recommendation is made in the next chapter in relation to this issue

**Mass DNA testing and “surveillance”**

A notable feature of the world’s first use of DNA testing in the Narborough Village murders was mass testing of around 4,500 male persons as part of the investigation (Gill and Werrett, 1987: 145-148; Wambaugh, 1989). A precedent existed in the UK with mass fingerprinting. In May 1948, in Blackburn, England, clear latent fingerprints were developed on a bottle at the murder scene of an infant, June Devaney. In the following six weeks, 46,000 sets of fingerprints were collected from males between ages 16 and 70 in the district, until those of Peter Griffiths were matched. Griffiths was subsequently
tried, found guilty and executed. The Chief Constable of Blackburn later publicly pulped the mass fingerprint cards (Godwin (ed.) 1950: 66, 160).

In the UK by 2000, according to Dr Tony Raymond, then Director of the NSW Police Forensic Services Group, at least 144 mass DNA testings had been conducted (quoted in Roberts, S., 2000: 4), while in New Zealand a mass screening of about three thousand people had been held in South Auckland to find a serial rapist (McBride, 1997:71). The Victorian Privacy Commissioner has identified as a privacy issue the “intrusion by the state into a person’s day-to-day life without specific grounds to suspect that person, such as where the police ask volunteers in a small community to come forward and provide DNA samples as part of a mass screening” (OVPC, 2002: 1).

Relatively few such testings involving far smaller numbers have occurred in Queensland. The first Queensland case in which DNA samples were taken in numbers was for “Operation Grace”, a police investigation that targeted a serial “granny rapist” in Brisbane’s southern suburbs in the late 1990s. Police narrowed the suspect description to a State government Q-Build worker, and took voluntary DNA samples from around 50 employees. Forensic scientists were then able to match one of the samples to trace evidence from victims and arrest a suspect who was later found guilty of the offences (QHSS Forensic Biology Laboratory file, “Operation Grace”). In Toowoomba, 80 men provided DNA samples during the investigation of the rape and murder on Easter Sunday 2002 of 28-year-old Tamara Smith. In Gympie, samples were taken from nearly 200 males in the search for a serial rapist believed responsible for 12 attacks over six years. By mid-2002 in Bundaberg, police had asked all north-side male residents to provide samples for comparison against male saliva found at the murder scene of 19-year-old British backpacker, Caroline Stuttle (Dibben, 2002: 5). When Ian Douglas Privite was later found guilty of that offence in October 2004, no DNA evidence was produced at his trial (Green, 2004: 33).
A mass testing in Australia that created great public controversy was in the New South Wales rural town of Wee Waa. At the end of 1998, a 91-year old woman was sexually assaulted, and in April 2000, with the case still unsolved, police asked the six hundred males aged between 18 and 45 years, living in the town, to provide saliva swabs. A few weeks after the sampling began, a 44 year-old man, Stephen Boney, confessed to police before the results of the analysis of his sample were known. He later pleaded guilty and was sentenced to twelve years imprisonment (Saul, 2001: 75). Such mass testings have been criticised as infringing civil liberties by creating suspects from anyone who refuses to “volunteer” a sample, as is reflected in a newspaper story lead: “City where every man’s a suspect” (Dibben, 2002: 5). In Wee Waa, at least a dozen men refused to donate samples, as against 420 who did (Civil Liberty Journal, NSW, October 2000). Critics argue that this is effectively reversing the onus of proof, in this case by acting to cast police suspicion on non-donors.

During the Wee Waa testing, police observed volunteers’ behaviour for signs of fear or anxiety, and noticed that Boney’s hands were shaking during the testing. This form of psychological pressure that stems from a police request to provide a DNA sample, and which led to Boney confessing, has been termed “DNA request surveillance” and possibly constitutes an infringement of the privilege against self-incrimination (Gans, 2001b: 170). Mass testings have also been criticised as “arguably reducing the chances of the accused getting a fair trial” (Lagan and Kennedy, 2000: 3), while “there is a tendency of DNA testing to replace trial, since a charge becomes determined by the apparently definitive and publicly conclusive DNA test…even though a myriad of scientific, statistical and procedural issues may affect the accuracy of a particular DNA test” (Saul, 2001: 78).

Robin Napper, a former UK Detective Superintendent of 29 years experience, who helped author enabling DNA legislation for several Australian states, defended mass testing, noting, “the UK experience is that people are only too keen to help the police in major investigations. If called upon to give a mouth swab to eliminate a targeted section of the population in the case of murder or other serious crime, the public have always
given 99 percent co-operation. In a democratic society we police by consent” (Napper, 2000: 68). Such mass testing is not routine and is usually reserved for extreme cases where police have exhausted other leads and there is a chance that the offender is confined to a particular geographical area. In most, but not all cases, volunteered samples are later destroyed.

A preferable alternative to mass testing may be targeted area testing. This relies on geographical profiling of offenders’ spatial behaviour, using analytical tools for offender residence prediction in order to narrow investigators’ search parameters. Computer programs available to perform such searches are Dragnet and CrimeStat II. (For CrimeStat II online, see: http://www.icpsr.umich.edu/NACJD/crimestat.html, accessed 31 August 2003; see also Santtila, Zappala, Laukkanen and Picozzi, 2003: 42-52, and Branca, 2003). Narrowing the numbers of people to be tested can reduce the number of potential objections on civil liberties grounds, at the same time as it facilitates, cuts costs and shortens the task of investigators.

**Rights of victims of crime**

Napper has also drawn attention to the civil rights of crime victims, including the rights of people to go about their affairs without fear of violence; and

the civil rights of grieving families who have already been sentenced to a life of mourning for their lost loved ones. In any debate these groups are just as important to maintain the balance of the argument. Their voices must be heard along with everyone else’s…Victims are real people and not just statistics (Napper, 2000: 68-9).

One such victim in the US was Kellie Green, who was brutally attacked and raped in 1994 following a visit to the laundry in her apartment complex. Although DNA evidence was retrieved from her sweater, funding issues in Florida prevented testing until 1997, when a match was achieved and a conviction obtained. The *OVC Bulletin* described her in the aftermath of the crime:
The road to recovery for Kellie, and countless other rape survivors, is paved with anger, loss, rage, sadness, numbness, confusion, shame, guilt, fear, despair and courage. The rape is a memory that never disappears and one that marks a woman’s life forever. The experience shapes how she reacts to life’s challenges and unexpected turns, how she gets through each day, how she sleeps at night, how she feels about her sexuality, how she feels about her body, how she feels about men. “I think I always will struggle with the sexuality. It’s never the same. Something that should be natural becomes something that you have to work at,” Kellie said…In 1999, she formed a non-profit organization named SOAR – Speaking Out About Rape, Inc. She travels across the country giving rape awareness seminars about the healing process and the importance of DNA evidence in solving cases (Turman, 2001: 5-6; SOAR, 2002).

A conviction is important in assisting both the healing process and towards closure for victims. Victim-offender conferencing, where potentially beneficial, can also be arranged in the wake of a conviction (Daly, 2004; Flaten, 1996; Umbriet, 1998). Many civil rights advocates focus on the civil rights of the accused, at the expense of the rights of victims and their families.

**Database concerns and “function creep”**

In addition to the TH01 marker being a pointer to diabetes, another concern for civil libertarians has been database mismatches through false inclusions, of which there have been at least two noteworthy instances overseas. In the UK, a mismatch of an individual to a burglary scene occurred on the national criminal database, when the analysis of six regions of DNA was being used. It was claimed that there was only a one in 37 million chance of the match being other than that of Raymond Easton, a builder from Swindon, who had given a DNA sample in 1995 following a minor domestic incident.
When Easton was interviewed in 1998 in relation to the burglary, he protested his innocence. By then, he had contracted Parkinson’s disease, was unable to drive, lived 320 kilometres from the burglary, and found even dressing himself difficult. He also had an alibi in that he was babysitting a sick daughter at home at the time of the burglary. Charged on the basis of the DNA evidence, Easton spent several months in prison on remand. Only because of the insistence of his solicitor, rather than due to the unlikelihood that he had committed the crime, was the testing of a further four loci conducted that eliminated him as a suspect. British authorities did not publicly acknowledge the mistake for almost a year after it occurred. Questioned about the failure to reveal the error, a Home Office spokesperson stated in defence that no system was 100% foolproof. Later remedial action by the Forensic Science Service included introducing a ten loci test as standard thereby reducing the risk of a chance match to an estimated one in a billion (Moenssens, 2000; Concar, 2001b: 7).

In New Zealand in 1999, the DNA database linked a Christchurch man to two murders in Wellington. A later inquiry found that the Christchurch man’s sample, which was held because he was the victim of an unrelated crime, had contaminated the murder samples. An extensive inquiry at the laboratory could not explain how the mistake had happened (Eichelbaum and Scott, 1999; Fordham, 2003: 15). Doubts about the accuracy of DNA testing procedures later surfaced in Victoria in 2003. DNA on the bib of a missing toddler, Jaidyn Leskie, who was later found killed, was matched to a 22-year-old female rape victim from Werribee. Police said the cases were not connected. Either the samples were matched incorrectly, or there was contamination in the laboratory. According to David Galbally QC, “Both scenarios have tremendous implications for the legal system in Victoria…with the potential to affect every DNA case until the Leskie issue is sorted out” (quoted in Moor, 2003).

A further issue of concern to civil libertarians and brought to public attention in the UK by the media was the retention of DNA samples on the national database, of persons found innocent in court. This situation eventually gained the support of the House of Lords, but was contrary to legislation at the time, and also contravened Article 7 of the
Universal Declaration on Human Rights and the Human Genome (UNESCO, 1999). This is an example of “function creep” that the Privacy Commission of Canada warned could follow the introduction of DNA databases (Privacy Commission of Canada, 1998). An accused was arrested and charged for a burglary offence, his DNA taken and added to the database, but at trial he was found not guilty. Under the *Police and Criminal Evidence Act* (PACE), the DNA sample should then have been destroyed and the profile removed from the database. It was not destroyed, but was later matched to the DNA from a crime scene where a 66-year-old woman had been raped and burgled. At the trial for the rape and burglary, argument was based on the original, illegally held sample that provided the cold hit, rather than on a second sample taken by police from the accused during the rape investigation (Barnett, 2000: 4; Kellie, 2001: 174-5).

The trial judge in the case decided that the evidence was inadmissible, and directed a “not guilty” verdict. The Court of Appeal referred the matter to the House of Lords, who allowed the evidence. Lord Steyn in the leading judgement stated,

The purpose of the criminal law is to permit everyone to go about their daily lives without fear of harm to person or property. And it is in the interests of everyone that serious crime should be effectively investigated and prosecuted. There must be fairness to all sides. In a criminal case, this requires the court to consider a triangulation of interests. It involves taking into account the position of the accused, the victim and his or her family and the public ([2000] UKHL 63, 14 December 2000 at para 25).

However, this decision arguably conflicts with Article 7 of the UNESCO Declaration: “genetic data associated with an identifiable person and stored or processed for the purposes of research or any other purpose must be held confidential in the conditions set by law” (UNESCO, 1999).
The response to the fact that “many thousands of such samples are being held outside the rules”, that is, illegally, brought about the recommendation from Her Majesty’s Inspector of Constabulary that “the time is now right to revisit the PACE requirements to remove the CJ samples from the National DNA Database” (Blakey, 2000a, ix). Rather than ensuring that the DNA database met legislative requirements, Blakey proposed instead to amend the law to conform to what the database contained. This proposal was enacted the following year in the *Criminal Justice and Police Act 2001* (UK). The UK database can now be expanded to retain DNA from innocent persons (Gunn, 2002: 10), further exacerbating concerns of both civil libertarians and evoking a critical editorial from the normally staid *New Scientist* (Concar, 2001c: 3).

The use of familial searching of DNA databases was noted in Chapter 3, where the deceased murderer of three teenage girls in south Wales was identified 29 years later through the database profiles of his relatives (FSS, 2003: 24-5). This has opened another door for function creep. Although the FSS Databases Board sought advice from the Information Commissioner on the ethics and data protection issues of using this approach, family DNA later helped catch a 20-year-old man in Surrey, who killed a lorry driver by throwing a brick through his windscreen (*Jane’s Police Review*, 2004a: 1). It appears only a matter of time before the familial searching technique is progressively extended to less serious offences.

Further instances of function creep are found in the US. Contrary to guidelines issued by the Council for Responsible Genetics, DNA samples taken from two million service personnel for the identification of battle casualties (Leary, 1992) will be made available to police (Wilker et al., 1992: 148; Privacy Commission of Canada, 1998; see also Kearney, 2002: 15). Legislation in the US for database sampling of individuals has also become progressively more inclusive as the technology improved over time (Schellberg, 2002; Steinhardt, 1999: 1). Queensland’s Premier Beattie displayed enthusiasm for extending the State’s DNA database immediately in the wake of the Court of Appeal decision on the *Button* case, ostensibly to protect the innocent. On 14 April 2001 he announced that from 26 April that year, legislation would be introduced to require
mandatory testing of all those charged with an indictable offence, while persons on lesser charges would be asked to volunteer a DNA sample (Sunday Mail, 14 April 2001: 1). (A recommendation about “function creep” is made in the next chapter).

**Planting or “forgery” of DNA evidence**

A further objection raised against DNA evidence is the possibility that it might be used to incriminate an innocent person. Scenarios have been proposed that include either offenders laying false trails, or corrupt police wishing to implicate or incriminate someone – “giving presents” in police parlance (Kirby, 2000b). Gans has suggested that the informal covert gathering of DNA samples, as described in the “Duck Robber” case above, if done regularly, “will lend plausibility to fears that police may plant a person’s DNA at a crime scene” (Gans, 2003: 3). This would arise from the belief that a covertly gathered DNA sample from a known suspect could be used for incriminating purposes by being planted at a crime scene.

Fabrication of evidence by police, uncovered by reviews like Queensland’s Fitzgerald Inquiry (1987-89) or the Wood Royal Commission (1994-97) in New South Wales, would lend credence to these concerns (Wilson, 2000: 13; O’Gorman, 2000: 15). According to Professor Paul Wilson of Bond University, “a drink with a mate at a pub offers the chance for saliva samples on a glass to be transported to a crime scene” (2000, 13). A fictitious case of planted DNA evidence can be found in novelist Scott Turow’s *Presumed Innocent* (1988). The plot includes an attorney’s wife murdering her husband’s lover and implanting his semen, which she has taken from her own body, into the victim.

Some technical difficulties exist to the successful planting of DNA. Saliva on drinking glasses, soft drink cans or food has only around a ten percent success rate for profiling, due to the low levels of cells present and the harsh environment, such as the acidity levels in soft drinks, to which the DNA is exposed (Wilson-Wilde, 2001: 4). NSW Privacy Commissioner, Chris Puplick, has offered the more plausible scenario of retrieving and
planting a cigarette butt (quoted in Scott, 1999: 9), while a similar example of saliva or cigarette butts being previously left at a scene by innocent parties was raised in Canada (McDonald, 1998: 18). Jeremy Gans has offered the following opinion on this issue:

There is at least one sort of improper practice with respect to DNA identification that cannot be prevented: the fraudulent planting of a person’s DNA at a crime scene. It may be possible to secure a crime scene once it is brought to the police’s attention; but nothing can secure a crime scene before that point.

Accordingly, the prospect of fraudulent planting of DNA will always be a potential issue in every investigation and trial involving DNA identification evidence. Because of this, any claim that DNA identification will guarantee – or even greatly improve – the accuracy of investigation and prosecution must be taken with a grain of salt. There is no such thing as perfect, fraud-proof evidence. Certainly, DNA identification evidence falls far short of that description (2003: 21).

Until controlled field experiments are arranged to investigate the issue of spurious DNA evidence, the arguments and counter-arguments are largely speculative. David Berryman (2003), a researcher at Murdoch University Western Australia, has conducted some related research. He contends that new technologies allow implanted or “forged” DNA to be introduced at crime scenes by means other than through the deposition of hair, blood or saliva (2003: 7). He adds that because of the haste to introduce DNA into forensic science, issues of forgery were not properly examined. Results of his experiments showed that criminals could feasibly produce and use PCR-STR amplicon – the replicated DNA produced from the polymerase chain reaction (PCR) as described in Chapter 3 – to contaminate crime scenes. Berryman reported that a diluted sample of one millilitre, when sprayed with a perfume dispenser over an area half a metre square, was sufficient to contaminate a small blood spot so that the correct DNA profile could not be detected. Instead, a falsely substituted profile resulted. He concluded that individuals
with even the most basic technical skills could perform all the required procedures and purchase all necessary equipment on the open market (ABC, 2004).

According to Berryman,

> We believe that it is only a matter of when, not if, DNA profile forgeries begin to appear…If this type of DNA profile forgery were to become widespread it is likely that many criminals would escape conviction. Courts may be less accepting of DNA evidence and there may be a loss of trust in the system by the general public. Most worrying of all though is the possibility that contaminated profiles will be entered into the DNA database without question, or that an innocent individual will be incriminated whether on purpose or by accident through the examination of a contaminated crime scene sample. With the increasing reliance on DNA evidence and database “cold hits” this is certainly possible and as such the possibility of malicious amplicon contamination of crime scenes must be considered (Berryman, 2003: 12).

Information was already posted on the internet in 2002 containing instructions for producing such amplicon contaminant (Koupparis, 2002a). Although the suggestion of criminals, manufacturing, selling and distributing this material may appear far-fetched, outlaw motorcycle gangs (OMCGs) and others already conduct similar activities with their production and marketing of amphetamines (“speed”) and selling illicit tobacco products (“chop-chop”). By way of response to the possibility of amplicon substitution, the forensic biology laboratory in Western Australia initiated experiments to determine if it were possible to contaminate crime scenes with aerosol Profiler Plus PCR product, with the objective of producing a position paper.
In theory, courts take into account the transportability of objects in weighing their evidentiary value, and consider all evidence presented when taken as a whole, rather than assessing one piece of evidence in isolation. It is well established that the jury must consider “the weight which is to be given to the united force of all the circumstances put together” (535) per Gibbs CJ and Mason J. in Chamberlain (1983) 153 C.L.R. 521 at 535. This decision was confirmed in the Queensland Court of Appeal in R. v. Cook, Coleman, Kake, Innes and Le Blowitz (unrep Qld CA Nos 219, 231, 242, 243 and 250 of 19 November 1996) and extended to include circumstantial evidence corroborated by evidence from accomplices in Doney v. The Queen ([1990] 171 CLR 207, 211). In relation to circumstantial evidence, the courts have ruled that juries should not reject one circumstance because, considered alone, no inference of guilt can be drawn from it. Forensic DNA evidence should therefore be included for consideration with, and in a context of, all other evidence and testimony presented (Queensland Police Service, 1997: 2). The reality following a DNA match, however, may instead follow the scenario in the Raymond Easton case outlined above, and it may only be fortuitous if the accused is ever eventually cleared.

The only Australian case encountered in this research, involving a claim of planted blood evidence, was R. v. Lisoff in New South Wales in 1999 [1999, NSW, CCA at 364]. The charge was one of serious assault, and the trial judge ruled to exclude scientific evidence in the grounds of the complex circumstances of how the blood came to be on the clothing of the accused. There were accusations that a post-transfusion sample of blood from the victim had been planted on the clothing of the accused. The Court of Appeal in overruling the trial judge pointed out that “complex scientific questions raised by conflicting scientific evidence are no more complex than in most criminal cases” (quoted in Hocking and McCallum, 2001: 12; see also Urbas, 2002: 156).

The Lisoff case was the subject of an ABC television documentary that suggested contamination or planting of blood evidence by police (ABC, 2002b), but Alastair Ross, then of the National Institute of Forensic Science, effectively rebutted the technical basis of the arguments. Ross pointed out that the silver staining method used in the ABC
program was notorious for producing additional spurious bands in samples, and for that reason has been discarded by most laboratories in favour of fluorescent detection systems. These additional bands had led to the conclusion that transfused blood was involved. Ross further explained:

Again, the Catalyst program failed to mention that the samples had been analysed by a university laboratory in Germany, testing the same loci as tested by the scientist called by the defence, but using fluorescent technology. No additional bands were detected. At best we see as example of selective reporting to support a particular theme (Ross, 2002: 19-20).

In Queensland, experiments or field trials on the viability of DNA “forgery” or planting of evidence might be conducted under the auspices of the Crime and Misconduct Commission because of the ethical issues involved. This body has powers to conduct integrity tests on individual State government employees. By extension, it may be able to test the integrity of the crime scene, laboratory and court procedures to determine through “blind” tests the extent that any such interference would be detected in the course of standard work practices. An alternative approach for any trials is to apply a variation of Richard Dawkins’ proposal, outlined in Chapter 11, on the place of scientists in the legal process. Because it is more within the province of their expertise, scientists and crime scene investigators may be far better qualified to experiment, analyse and report on possible fraudulent or “forged” DNA evidence than are legal personnel.

**CONCLUSION**

In the past, misuse of genetic information by the eugenics movement led to the sterilisation of prisoners, of the intellectually impaired and of the mentally ill, and in the US to the setting of immigration quotas. In the 1970s, Governments, employers and insurance companies showed their willingness to discriminate with asymptomatic sickle cell carriers on the basis of genetic information, while insurance companies in Australia in 2004 were continuing genetic discrimination. Both in the UK and in Australia (with
the Cofiler), one of the forensic markers used for identification is a possible indicator of a propensity to diabetes. Additionally, the Australian approach has been criticised for storing genetic samples for forensic use rather than simply recording the DNA profile. This can allow an analysis of the entire genetic makeup of individuals at some future time, as has happened overseas, if legislation were amended. Such an analysis could be used to predict susceptibility to disease, or possibly, behavioural traits. Pressure on governments to allow such access could come from researchers motivated to explore genetic links to criminal behaviour or from the pharmaceutical and biotechnology lobbies seeking experimental genetic material. Both police and governments have demonstrated such a preference for amending legislation in order to continue extending the scope of DNA sampling – a practice termed “function creep”. Some of the privacy issues may require legislative resolution, as when police obtain a DNA sample covertly from refuse, or when they conduct mass testings.

Initially, some civil libertarians objected to any DNA sampling from individuals, claiming that it infringed the right against self-incrimination, although the current predominant legal opinion is that this right applies only to responses to questions asked of suspects. On the other hand, DNA evidence has proved of value in fostering civil rights by eliminating persons as suspects and in exonerating the innocent after trial, although in two known cases in the US wrongful convictions were based on flawed DNA evidence arising from laboratory malpractices. Mass DNA screenings by police in geographical locations to identify perpetrators of major crimes have been criticised as reversing the onus of proof, and of turning the innocent into suspects. However, police have defended mass testing on the grounds that the public provides overwhelming co-operation, that the mass testings help maintain the civil liberties of victims and of innocent suspects, and that the practice is confined to exceptional cases. Lastly, the possibility of “planting” and “forging” of DNA evidence was considered. Although claimed to be technically feasible, until controlled field experiments are conducted, debates in this area return inconclusive results. Chapter 11, which follows, discusses how legislation should aim to integrate some of the concerns for privacy and civil liberties with effective crime control through DNA evidence and databases.
CHAPTER 11: A MODEL SYSTEM FOR BALANCING CIVIL LIBERTIES AND CRIMINAL JUSTICE GOALS IN THE APPLICATION OF FORENSIC DNA

INTRODUCTION

This final chapter suggests means towards achieving a balance between, on the one hand, the government and criminal justice systems responsibility for maintaining a safe society, bringing offenders to justice and reducing fear of crime, and on the other, the privacy and civil rights of individuals. Chapter 10 identified issues relating to privacy and civil liberties and forensic DNA, and this chapter continues examining those issues and makes proposals for their resolution. The chapter consists of three major sections: first, a general critique of the various State and Territory laws in Australia that apply to forensic DNA databases and sampling; second, an overview of procedures for crime scene sample collection, and for taking reference samples from persons; and third, an outline of advantages and disadvantages of a variety of service delivery infrastructure models. The position adopted in this thesis is that greater legislative powers for law enforcers in respect to forensic DNA can assist in achieving a safer society. At the same time, increased regulation of those powers can improve legitimate protection of privacy and civil liberties for citizens.

The chapter includes reference to reforms in the court process as proposed by the New Zealand Law Commission, and a call by Professor Richard Dawkins for an alternative form of decision-making: that scientists, and the scientific rather than the legalistic way of thinking may be better suited to reaching conclusions on disputed issues. It concludes by making a number of specific recommendations. Among these are suggested improvements to legislation to cover such issues as testing “non-coding” areas of the DNA molecule, retention of profiles only and not samples, mass testing, covert sampling, use of Guthrie cards, database regulatory monitoring, containing “function creep”, post-conviction appeals and the establishment of innocence panels. These are followed by recommendations on other issues raised during the course of this thesis including further research and development in the application of forensic
intelligence, reporting of results that use meaningful measures of effectiveness, improved interaction between laboratories and investigators and more open access to forensic scientists by defence counsel.

**Components of the system: crime scene, laboratory and court**

As mentioned in Chapter 2, forensic science has a tripartite structure consisting sequentially of the crime scene, the laboratory and the court. Ultimately, the aim of forensic science is to provide evidence for courts, which rely on case law and legislation in their decision-making. Case law is referred to briefly for its recognition of the validity of DNA evidence in court, but a more extensive examination of legislation follows. Legislation, or statute law, governs the collection of DNA samples from individuals, and according to Gans (2003: 2), impacts upon privacy in three ways:

Physically obtaining a sample intrudes on bodily privacy (i.e. the physical integrity of a person’s body), the analysis of the sample intrudes on genetic privacy (i.e. the information contained in a person’s genes) and the use of the information can intrude on behavioural privacy (i.e. information about where a person has been, what they have done and who they are related to (Gans, 2003: 2).

Legislated limits on the operation of DNA databases are therefore pivotal in achieving a balance between civil liberties and criminal justice goals. In addition to the effects of law on this balance are procedures for the collection of crime scene DNA samples; of DNA samples from arrested persons, suspects or prisoners; and procedures in the forensic laboratory. Achieving this balance requires effective and efficient procedures combined with minimal intrusiveness on the individual. A further component of the system is the type of infrastructure model used for delivering services. A number of models are in use, and their advantages and disadvantages are discussed.
Powers under law

Case Law

Australian courts have recognised DNA evidence as a valid form of forensic evidence since the late 1980s with the case of Desmond Applebee, which was recounted in Chapter 2 (Coelli, 1989). One role of the courts is to test for admissibility of novel categories of scientific evidence, and devise ways of keeping out “junk science”. Particularly since the Chamberlain and Splatt cases, Ian Freckelton considers that the courts have been engaged in a “quest for scientific rigour”, and that it is no longer acceptable for expert witnesses to offer “reliable opinions on matters which lay on the outer margins of their field of expertise” (1997: 1141-64). Following the 1989 Castro case, where the US Supreme Court held that DNA profiling was admissible and capable of producing reliable results, there was a worldwide trend increasingly to recognise DNA evidence as it became more reliable scientifically (Hocking and McCallum, 2001: 7).

Another landmark Australian case was Pantoja v. R., where the appellant was a South American Quechua Indian. In that case, it was held that the Polymerase Chain Reaction (PCR) technique and the Restriction Length Fragment Polymorphism (RFLP) procedure were generally recognised and accepted in molecular biology, their field of scientific specialisation (1996, 88 A Crim R 554 at 558). Courts internationally, as well as in Australia, have accepted the Profiler Plus technology as providing evidence with an extremely high degree of credibility. A thorough examination of case law in Australia is outside the scope of this thesis, but Freckelton and Selby (2002: 478-547) have researched this issue, while Griffith (2000: 8-11) provides a brief summary of relevant New South Wales case law. Case law on international legal decisions involving DNA has been posted on the internet by the District Attorney’s Office in Denver Colorado, and is available at: http://www.denverda.org/html_website/denver_da/DNA_statistics_legal%20decisions.html (accessed 18 October 2003). To provide a reminder that DNA evidence is fallible, Judith Fordham (2003: 14-16), a Barrister and Forensic Consultant at the Centre for Forensic Science at the University of Western Australia, has cited as examples a number of cases such as that of Raymond Easton (see pp 265-6). She
concludes that, like other forms of evidence, DNA should be scrutinised carefully by jurors, lawyers and judges before it should be relied upon to establish guilt or otherwise.

Statute Law

Through statute law, legislators in Australia have achieved a significant integration of forensic DNA into the justice process, particularly in the sampling of individuals and in the foundation of forensic DNA databases. In the opinion of the Office of the Victorian Privacy Commissioner (OVPC), enacting the best legislation on DNA databases was of the utmost importance because:

The science of genetics is developing in ways that may make today’s certainties less obvious tomorrow and tomorrow’s discoveries perhaps more challenging to lawmakers than today’s knowledge might seem. Any DNA databases built now may in future take on far greater public policy significance (OVPC, 2002: 37).

The following discussion intends to formulate general principles that should be applicable to any legislation that aims to achieve a balance between the privacy and civil liberties expected in Western democracies on one hand, and community safety and achieving justice on the other. It does not propose to analyse or to address all the specifics of the legislation in various Australian jurisdictions as such a commentary would be far too extensive. However, much of the legislation on DNA throughout Australia shares common ground on the issues selected. In some instances, reference is made to legislation in Queensland, where this research was conducted. The history behind the introduction of a national DNA database in Australia was recounted in Chapter 2 under the heading “Organisational developments”.

Gans describes this Model Bill as having serious flaws. Particularly cogent is his criticism about the difficulties caused by the incompatibility of separate legislation in the different Australian States and Territories. For example, a DNA profile of a juvenile in one Australian State may not necessarily be allowed by legislation to be compared to crime scene profiles in all other States (Mobbs, 2001: 11-19). By contrast, Canada has a single law applicable throughout all Provinces. The incompatibility in Australia has serious implications for privacy and accountability where DNA profiles are shared across jurisdictions.

Major deficiencies in the Australian legislative regimes are noticeable in the lack of regulation of particular facets of forensic DNA use. To remedy these deficiencies would improve citizens’ privacy and civil liberties while contributing to public safety and justice. In Queensland, these deficiencies exist despite extensive community consultation conducted during the time the Bill on forensic DNA was before Parliament. Unlike the Commonwealth’s Model Bill, the draft Queensland Bill was never released as a discussion paper. Included in the consultation process in the State, were a variety of stakeholders: the Queensland Council for Civil Liberties, the Queensland Bar Association, the Queensland Law Society, Queensland Health, the Families Department, the Department of Justice and Attorney General, Queensland Corrective Services, the Police Powers Review Committee, Queensland Disability Services, Queensland Legal Aid, Queensland Aboriginal Legal Aid and Prisoner Legal Services. Following the consultation, no amendments were put forward in the Queensland Parliament and the Bill was passed unchallenged (Ede, 2003).

Deficiencies or omissions identified in legislation Australia-wide relate to the issues of mass testing, of covert sample collection, the investigation of relatives of someone partially matched on a database and the specific prohibiting of non-forensic testing. No mention is made about the forensic analysis of Guthrie cards and there is a lack of post-conviction legislation to facilitate the admission of new DNA evidence. Recommendations that correspond to the issues raised within this chapter are made at its end. Numerous papers are available that provide detailed discussions of the specifics covered by statutes in Australia, and how they relate to privacy. These are by Green (2000), Griffith (2000), Meagher (2000), the New South Wales Ombudsman (2001), Haesler (2001), Gans (2002), the Australian Law Reform Commission (2002).

Issues examined

Obtaining samples from individuals

A contentious legislative issue in relation to forensic DNA has been the circumstances under which samples can be obtained from suspects or arrested persons. The Associate Director of the American Civil Liberties Union, Barry Steinhardt, has pointed out that in the relatively few years during which technology has improved, DNA usage has broadened from targeting sexual offences and homicide cases, to encompass expanding segments of the population, as the legislation strives to keep pace with the technology (Steinhardt, 1999, 2003; see also McCue, 2001 and Schellberg, 2002). Legislators have been faced with choices on how comprehensive to make the databases in their jurisdictions.

Tracy and Morgan (2000) identified two broad groups into which US legislation fell. In the first group, databases targeted sex offenders only. The second group legislated to “include DNA from persons with convictions for some or all of the State’s felony offences” (2000: 684-5). Outside these broad groups, Louisiana had the strongest legislation, where a person arrested for a specified offence, such as a simple assault, must submit a DNA sample at the same time as being fingerprinted. However, only eight American States allowed the use of reasonable force to obtain samples from unwilling subjects. Over three-dozen US States legislated for destruction of records relating to samples on their databases, but “The fact that these statutes are subject to almost constant revision presents a rather large obstacle to a comprehensive survey” (Tracy and Morgan 2000: 684-5).

By 2000, some European countries were still in the process of legislating for sample collection, as was Australia. With the Criminal Justice and Public Order Act of 1994, the United Kingdom already had the most permissive law that allowed DNA from persons charged with “any recordable offence” to be entered in the database, and DNA was usually sampled when fingerprints were taken. Most sampling of offenders in the US for database purposes, however, was undertaken only after conviction. On
the European continent, large gaps exist between countries in respect to the compulsory acquisition of samples for prosecution purposes. As a general rule, force cannot be used in southern European countries to take a sample, whereas in northern nations necessary force can be used (Guillen, Lareu, Pestoni, Salas, and Carracedo, 2000: 266; see also Schneider and Martin, 2001).

Legislation in Australia tends to follow the UK rather than the US model, with samples taken on arrest, especially for indictable offences, rather than on conviction. Some legislatures, however, like that of Queensland and the ACT, depart substantially from the provisions of the Model Bill, with Queensland’s legislation allowing for less stringent procedures for the collection of samples. Unlike in the Model Bill, police are empowered under sections 308 to 316 of the Police Powers and Responsibilities Act 2000 (PPRA), to carry out forensic procedures on suspects who refused consent without a magistrate’s order being necessary (The Office of the Federal Privacy Commissioner, 2000: 1).

Ultimately, legislators in each jurisdiction must decide upon and review where the balance lies between the inevitable invasion of individual privacy through sample collection and the interests of public safety. In their deliberations, legislators might weigh the added benefits of DNA’s effectiveness in the very small proportion of cases where it is used on one hand, against the implementation, infrastructure, privacy and civil liberties costs on the other. In decisions to further extend sampling, they also need to consider the lack of any conclusive evidence to date that DNA either has reduced property crime levels or has demonstrated measurable deterrent effects.

**Type of analysis permitted on samples**

Referring to fears about threats to privacy and civil liberties in Australia through forensic DNA testing, the Office of the Federal Privacy Commissioner (2002) emphasise that DNA sampling can be conducted for two main purposes: first, to associate an individual with a crime, a crime scene or an exhibit; or second, to obtain genetic information about a person that would indicate characteristics such as susceptibility to heredity diseases. In the first case, because the regions of the DNA molecule tested are the “junk DNA”, it contends that the information obtained about
an individual is of no more significance than that which could be found from dermal fingerprints. In the second instance, the intention is to derive information about a person’s genetic constitution. Police organizations presently collect DNA for profiling for the former purpose, that is, for identification (Federal Privacy Commissioner, 2002: 46.4). The Victorian Privacy Commissioner qualified that opinion, “The term ‘junk DNA’ has a ring of arrogance”, and pointed out that in future this information may be found to reveal personal traits or susceptibility to diseases (OVPC, 2002: 2). Chapter 10 illustrated how this had already occurred to some degree with the TH01 marker in the UK. Further, if in the next phase of the technology personal characteristics such as the skin, hair or eye colours of suspects are to be analysed from trace DNA, regions other than the “junk” areas would be examined (OVPC, 2002: 2).

Legislation to prohibit explicitly the analysis of forensic DNA samples for purposes other than identification would alleviate public concern in this area considerably. The Act concerning databases in the US State of Rhode Island provides, “DNA samples and DNA records collected under this chapter shall never be used … for the purpose of obtaining information about physical characteristics, traits or predispositions for disease” (State of Rhode Island General Laws § 12-1.5-10 (4)). The Queensland PPRA 2000, sections 302 and 303, on who may take a DNA sample for example, permits taking “a DNA sample from a person for DNA analysis” without specifying the purpose or type of analysis to be done. Section 318G of the same Act, “Power to analyse etc. DNA samples”, empowers persons “to perform a DNA analysis of a DNA sample”. The type or types of analyses that may be performed on the sample again are not specified, leaving them by default, unregulated.

A related issue is that testing might also be used to determine blood relationships among persons whose DNA has been sampled. Such testing would contravene a right to privacy of behaviour regarding a person’s blood relationships that they or others might wish to remain confidential. Unless specifically pertinent to the circumstances of the case – incest for example – this type of testing in the forensic context should also be prohibited by legislation. (See “Recommendations” later in this Chapter).
Retention of profiles but not samples

There appears to be little or no necessity for samples to be retained for criminal justice purposes once their DNA has been profiled. If a further profile were required for any reason, and provided the person is available, as they would need to be for a court matter, another sample can be volunteered or taken. With database use, after a cold link is made, a further sample should be taken on arrest for use in court in any case, so as not to prejudice the court with the implication that the defendant has a previous criminal record. As with the preceding point about restricting the type of analysis, the destruction of samples would engender greater public confidence in the national DNA database system. As was noted in Chapter 10, the genetic database of the entire population of Iceland was sold to a private company despite objections, and any lobby group representing persons with criminal samples could be expected to have minimal political influence. The very existence of a repository of samples may act to tempt authorities to divert them into other uses, such as biomedical experiments, or test to search for the “criminal gene”, thereby allowing further “function creep”. However, one argument used in favour of sample retention is that future technological advances may require sample re-analysis (Findlay, 2004). The counter-argument is that legislation could be reassessed if that eventuality arises.

Mass testing

As mentioned in the last chapter, the occasional mass testing of volunteers has been regarded as an intrusion on people’s daily lives where volunteers are asked to provide DNA samples even though there is no reason to suspect them. Despite a number of mass testings being conducted in Australia, as at Wee Waa in New South Wales and Bundaberg in Queensland, no legislative guidelines have been provided under which authorities can administer such screenings. The New South Wales Legislative Assembly Standing Committee on Law and Justice recommended legislating that a court order be obtained before police could undertake voluntary mass screenings:
In determining an order for a voluntary mass screening, a judicial officer be required to be satisfied that the order is justified in all of the circumstances, taking into account whether a small number of potential suspects could instead be tested, and whether any less intrusive means are available to further the investigation (Standing Committee on Law and Justice, Legislative Council of New South Wales, 2002: 98).

The concept of targeted area testing, assisted by dedicated computer programs, as mentioned in the previous chapter, might be used in conjunction with such a judicial order.

**Covert collection of samples**

Although instances of the covert collection of samples for DNA analysis in Queensland were found to be exceptional, it is also a practice that should be regulated. The British government, in 2002, foreshadowed legislation that would make the surreptitious collection of DNA illegal (Koupparis, 2002b: 2). Whether this was intended to deter planting or “forgery” of DNA, or to prohibit individuals commercially testing familial relationships was unclear. In the previous chapter, the US cases of the “duck robber”, whose DNA was profiled from expectorant, and a rape-murder case, where the suspect’s DNA was profiled from discarded cigarette butts, were discussed.

In Queensland, only two cases were located where covert collection was conducted. One case involved a suspected serial rapist in Toowoomba, who was subsequently convicted and imprisoned, never to be released. In the other case, covert police operatives took the cigarette butt of a suspect who was later charged with the murders of a number of prostitutes (Freney, 2003). Indirect means have also been used to obtain at least one suspect’s DNA in Queensland, although this occurred prior to the passing of the *Police Powers and Responsibilities Act 2000*. During the highly publicised “Catwoman” murder investigation, as outlined in Chapter 9, police retrieved a handkerchief at Andrew Fitzherbert’s home, from which they took mucus for analysis. The DNA profile from the mucus matched tiny spots of blood left at the

The sections covering powers to sample for DNA under Queensland’s *Police Powers and Responsibilities Act* 2000, Part 5, originally referred to the gathering of comparison samples through the use of “forensic procedures”, although the term has since been amended to “DNA procedures”. The former term was also used in the Commonwealth’s *Model Forensic Procedures Bill*, (the Model Bill), endorsed by the Ministers at the Standing Committee of Attorneys-General, and is carried into other Australian legislation. The *Police Powers and Responsibilities Act* provides no guidelines for covert gathering of DNA samples that are no longer part of a person’s body; for example, from saliva they have spat, drinking glasses, cigarette butts, eating utensils, tissues they have blown their nose on, used condoms and so on. Gathering such samples encroaches upon a person’s freedom to blow their nose, to spit and so on, without incriminating themselves. For those times when police need to obtain a sample without alerting a suspect to their interest, they should apply for a warrant along the lines of surveillance or covert search warrants (Gans, 2003: 4). In Queensland, sections 138 to 156 of the *Police Powers and Responsibilities Act 2000* apply to such warrants. In emergent circumstances, where the opportunity arises suddenly for police to gain a covert sample, prosecutors could apply subsequently to a justice or judge in chambers for retrospective authorisation. Such a procedure is used in the UK by counter-terrorist units (Rice, 2003), and could be evaluated for application to serious crimes in Australia.

*Timely destruction of samples and profiles*

Under some circumstances, such as when a person has been found not guilty of an offence, or a sample has been volunteered by a victim for elimination purposes, most jurisdictions provide for destruction of profiles and in some cases, of samples, to prevent their future unwarranted use. Where samples are not destroyed, any means of identifying the sample must be deleted. In Queensland, s.318H of the *Police Powers and Responsibilities Act 2000* governs this procedure, specifying that it be done “within a reasonably practicable time after the end of 1 year”, although the exact period is left undefined.
When laboratory resources are stretched, with backlogs of tests related to current and forthcoming cases, it is inevitable that the destruction process for samples and profiles will lag. After similar problems with destructions in the UK, legislation was amended to allow the retention of samples and profiles of persons acquitted in the courts (Blakey, 2000a: ix; Gunn, 2002: 10), a situation cited elsewhere in this thesis as an example of “function creep”. This was later rationalised on the grounds that, of 10,491 such profiles retained, 317 matches were made, including three for murder and five for rape (Napper, 2002).

As part of a regulatory monitoring process directed at rectifying this situation, third party scrutiny of destruction records would provide an effective accountability measure. A similar approach has already been provided for in Part VIII of the Telecommunication (Interception) Act 1979, where the Commonwealth Ombudsman inspects the records of the Federal Police at least twice yearly. The success of this procedure, involving the monitoring of a similar intrusion on privacy, tends to indicate the appropriateness of a parallel system for forensic DNA samples (Office of the Federal Privacy Commissioner, 2002: 48.2).

**Guthrie cards**

The access, if any, that police might have to Guthrie cards needs to be regulated to maintain public confidence in that system, otherwise the disastrous situation might come about of people refusing to have their children screened at birth. Currently in Queensland, use of the cards by investigators is subject to a ruling by a Supreme Court judge on a case-by-case basis. In Victoria, the Melbourne Children’s hospital has an agreement with local police, but an alternative arrangement has been suggested by Privacy Victoria, which advocates government regulation in relation to the cards.

They believe that any use should:
- Be subject to clear purpose limitations;
- Be a technique of last resort in only the most serious cases;
- Not result in addition of the DNA (or derived data) to any other database;
• Require informed consent in all but the most unusual cases; and
• In all cases require a court order to be obtained after public proceedings, about which reasonable notice should be given to relevant parties to put appropriate submissions to the court (Office of the Victorian Privacy Commissioner, 2002: 36).

Such a structured formal arrangement would have the advantages of a presumption of privacy, along with foreknowledge of requirements by investigators.

**National database monitoring**

Issues of privacy and avenues of appeal are also relevant to the national DNA database. The Office of the Federal Privacy Commissioner recommended measures to ensure a proper, external regulatory monitoring of the national DNA database, commenting:

> Indeed, continued public acceptance of the database surely rests on guarantees of accountability, and assurances that the database will be effectively and securely managed – with such management open to independent, third party scrutiny. Such oversight (involving regular monitoring, auditing and reporting by independent authorities) will provide an effective accountability measure, which in turn can prevent, detect or rectify systemic non-compliance with database regulations (OFPC, 2002: 48.1).

The Commonwealth Privacy Commissioner’s functions include auditing CrimTrac and receiving an annual report from that organization (CrimTrac, 2003). However, the Commissioner rightly expressed the opinion that effective monitoring of DNA databases nationally involved more than just the CrimTrac agency. It should also include:
auditing and monitoring, on a periodic basis, the separate Commonwealth State and Territory forensic procedures regimes; and the operation of the national DNA database as a whole, particularly the interaction of the various forensic procedures regimes within the CrimTrac system (Office of the Federal Privacy Commissioner, 2001: 13).

Provision for some monitoring was incorporated in the New South Wales legislation, the _Crimes (Forensic Procedures) Act 2000_, which derived from the Model Bill. Under section 121, the Ombudsman was to scrutinise the actions of police under the Act for a period of two years. Following the two-year review period, the Ombudsman would table in the NSW Parliament a report on his or her findings. Queensland legislation contained no provisions for similar monitoring of the State’s DNA regime. While the National Association of Testing Authorities (NATA) currently audits all Australian forensic laboratories, they do not specifically target privacy issues or complaints. It is suggested that NATA, because of its familiarity with laboratory procedures, could include investigating privacy matters in its audits, reporting to Ombudsmen or Privacy Commissioners as appropriate.

**“Function creep”**

Three instances of “function creep” were encountered during this research. These were mentioned in the previous chapter. One was the expansion of the UK DNA database through the retention of the profiles of persons found innocent in court (Gunn, 2002: 10). Second, in the US authority was given for DNA profiles provided by military personnel for purposes of identification to be included on criminal DNA databases (Wilker et al. 1992: 148). Third, legislation in the US for database sampling of individuals became progressively more inclusive as technology improved over time (Schellberg, 2002; Steinhardt, 1999: 1). Function creep will more than likely arise again in the future with technological advances. As mitochondrial DNA testing becomes more common, and if scientists become able to predict characteristics like the colour of eyes and hair of suspects from residual crime scene DNA, new privacy issues will arise (Queensland University of Technology, 2000). To determine descriptive characteristics, testing will need to be conducted on regions of the DNA
molecule other than the “junk” areas (see Databases vs databanks in Chapter 10). The argument that testing to date has been confined to the “junk” areas has been used to quell fears about infringements of privacy.

**Transferability of DNA**

The possibility of DNA being transferred was discussed in Chapter 10 under “Planting or ‘forgery’ of DNA evidence”. One example given was the planting or previous deposition of cigarette butts, saliva or so on, at crime scenes that could create false leads, although such leads are provided by the laboratory for intelligence purposes only, and should be fully investigated prior to any arrest. Another possibility tested by Berryman (2003; ABC, 2004), with details posted on the internet (Koupparis, 2002), was that PCR-STR amplicon contamination could be used to substitute a different DNA profile. For the purposes of transparency in justice and to foster public confidence in the system, a position paper on amplicon contamination needs to be compiled by Australian forensic laboratories and made public.

As Gans noted (see Chapter 10), the planting of DNA was a potential issue in every investigation (2003: 21). Until police secure a crime scene, it is open to contamination, and it is the responsibility of investigators to take this possibility into account and have full regard for other circumstances of the case, such as an alibi by the defendant. Defence counsel should also be aware of the possibility of DNA transferability, and raise it in court where applicable. If defence counsel fails to advise the jury and court on this issue where it is relevant, judges may need to take the unusual step of drawing attention to it in their summations.

**Establishment of innocence panels**

Legislation in NSW established an independent panel to review criminal cases where wrongful convictions were suspected. The panel was to consider cases where DNA evidence was unavailable or unable to be analysed at the time of trial; where DNA evidence from an accused was not considered; or where forensic DNA may point to another person (Saul, 2001: 84). The prisoners’ rights group, Justice Action, drew attention to the composition of the panel:
The Act does not guarantee access by prisoners to samples which may exonerate them nor provide any resources to enable them to have such evidence analysed and evaluated. The proposed Innocence Panel will include representatives from the police, DPP and victims of crime but not prisoners or their families, defence counsels, community organizations or Legal Aid (Justice Action, 2000: 3).

Despite Frank Button’s successful 2001 appeal in Queensland against a rape conviction, and the demonstration of the power of DNA to help prove innocence, it is surprising that no similar panel to that of NSW was established in Queensland. In the wake of the *Button* decision Premier Beattie extended DNA sampling purportedly to help the innocent (*Sunday Mail*, 14 April 2001: 1). However, State run Innocence Panels may not be desirable, because as was noted in Chapter 10, it was implied that such government-sponsored panels in the US were a “whitewash” because they had achieved no exonerations (Lazer, 2003: 4). The Criminal Cases Review Commission in the UK claims a more successful record. By 31 October 2004, it had received 7187 applications of which 6487 were completed. This resulted in 257 referrals to the Court of Appeal. Of 202 cases heard, 140 were quashed, 61 were upheld and one was reserved (CCRC, 2004). The degree to which DNA contributed to the successful appeals is unknown. However, a review of a sample of ten available judgements in these cases found that none of those ten appeals relied on DNA evidence.

In 2004, lawyers and students at Griffith University were operating the State’s first Innocence Project on a voluntary basis (*Alternative Law Journal*, 2001: 259; Stolz, 2002: 16). During the same year in the US, a $5 million grant under the Presidential DNA initiative was available to assist States defray the cost of post-conviction DNA testing (United States Department of Justice, 2003: 12). It is suggested for effectiveness, that privately operated innocence projects are desirable, but that their legitimate expenses should be reimbursed from public monies.
**Investigation of relatives following partial matches**

Some States in the US, Virginia for example, forbid on privacy grounds the investigation of relatives following partial matches on a database. This issue arises because, according to the US Department of Justice, “With 13 STR loci it is quite likely that a search of a database will identify a person who is a relative of the person who is contributing the evidence sample” (National Institute of Justice, 2000: 35). However, circumstances might arise, such as with a multiple murder, where the only lead is a partial match on the DNA database. In the absence of legal prohibitions, and if a laboratory were subject to intense media and police pressure for a result, following the lead through relatives may well occur and be justified.

Authorities in the UK would appear to agree. In Chapters 3 and 10, an instance was noted in the UK where a number of murders were linked through DNA, which was later matched through relatives to a deceased person whom investigators were certain was the culprit (Forensic Science Service, 2003: 25). In another example, family DNA later helped catch a 20-year-old man in Surrey, who killed a lorry driver by throwing a brick through his windscreen (Jane’s Police Review, 2004a: 1). “Function creep” in future, however, may cause relatives to be used as avenues of investigation following partial matches for progressively less serious offences. Rather than permit this to occur on an *ad hoc* basis, it is recommended that guidelines be drawn up outlining the particular circumstances, if any, under which familial partial matching would be acceptable.

**Model Procedures**

**Crime scene examination**

Powers available to police and guidelines to be followed by them at crime scenes are usually contained in legislation and written procedures. In Queensland, the applicable legislation is the *Police Powers and Responsibilities Act, 2000* sections 81 to 95. These sections cover the establishment of crime scenes, crime scene warrants and police powers at crime scenes. The QPS *Operational Procedures Manual* section 2, *Investigative Process*, provides procedures for police to follow. Scenes of Crime
Officers in some States, including Queensland, have procedures conforming to NATA accreditation guidelines. Police organizations conduct internal process reviews and evaluations to improve the effectiveness and efficiency of systems utilising DNA. The UK reviews by Blakey (2000a; 2002), however, were the only process reviews found publicly available and accessible online.

Examples for model systems and procedures for UK police as a guide to good practice are contained in a *DNA Manual* published by the Association of Chief Police Officers (*Jane’s Police Review*, 2004b: 1). This handbook builds on the work of the earlier joint FSS/ACPO publication *Using Forensic Science Effectively* (1996). The advice Her Majesty’s Inspector David Blakey quoted in Chapter 3, and conveyed in his report that was based on an inspection of UK police forces, may still apply in many jurisdictions:

> This report deals less with overall grand strategies for forensic science and technical support than with simply getting the basics right. These basics of integrating forensic science into mainstream policing, visiting the scenes, collecting the evidence, making identifications, acting on them and gathering intelligence are not intrinsically difficult to secure. The service can and must tighten systems and procedures to get the basics right: the future for crime reduction through the use of forensic science and technical support can indeed then be bright (Blakey, 2000a: xii).

Of equal importance to the collection of samples from crime scenes for police, is the sampling of individuals for comparison purposes.

*Collecting samples from arrested persons and from prisoners*

A buccal swab, that is, from the inside of the cheek, is now almost universally used for obtaining DNA samples from persons. This method is painless and has replaced blood extraction, which required the attendance of a qualified phlebotomist. The buccal swab method was pioneered in the UK and classified as a non-intimate procedure (Dovaston, 1996) – a legal distinction not made in Queensland. It has the
advantage of being able to be self-administered by consenting subjects under the direction of a police officer, with the analysis lending itself to automation and therefore to speed and cost savings. After collection of saliva and cells, the foam rubber swab is pressed on chemically impregnated paper that causes lysis or rupture of the nucleated cells, preserves DNA, and prohibits microbe growth, thereby rendering the DNA available for profiling. With subjects who do not choose mouth swabbing, a dozen or more hairs in the telogen phase, that is, with roots, can be taken instead. Procedures for police in Queensland to take DNA samples are contained in section 2.37 DNA Sampling Procedures of the QPS Operations Procedures Manual.

**Laboratory procedures, backlogs, errors and wrongful convictions**

Forensic laboratories in Australia are accredited through the National Association of Testing Authorities (NATA) to internationally recognised standards (ISO 17025). The Australian forensic community and NATA developed these standards jointly. The QHSS forensic laboratory that conducts DNA profiling is accredited under this program. Teams of external assessors regularly visit laboratories, usually each two years, with internal assessments occurring regularly to inspect and to review all aspects of practice. Internal quality assurance controls maintain standards between inspections, through performance of internal audits; by mandatory participation in external proficiency testing; through peer review of case files and reports, and by monitoring of court testimony (NATA, 2003).

One criticism of the NATA quality assurance process is that the rates from random chance or human errors in the laboratories, such as incorrect labelling of samples, are not provided to jurors. In an attempt to rectify this situation in the justice process, Schklar and Diamond contend that jurors should be provided with laboratory error rates determined by independent auditors when making their decisions (1999: 179). They believe this is essential, as courts have “voiced the concern that jurors may attribute an air of ‘mystic infallibility’ to scientific evidence” (1999: 159). According to one report, Jonathan Koehler of the University of Texas, Austin, who carried out statistical research in DNA laboratories on likelihood ratio analysis, stated, “The controversy over error rates is not over my calculations, but over the concept of an error rate” (quoted in Walsh, 2002; see also Koehler, 1997, 2001a and b). It has also
been argued that “ignoring or underestimating the potential for a false positive can lead to serious errors of interpretation, particularly when the suspect is identified through a ‘DNA dragnet’ or database search, and that ignorance of the true rate of error creates an important element of uncertainty about the value of DNA evidence” (Thompson, Taroni and Aitken, C., 2003: 47; see also Moenssens, 2000).

As outlined in Chapter 10, occasional errors, including at least two wrongful convictions based on flawed DNA evidence, have occurred overseas. In the Raymond Easton case in the UK there was an error through an adventitious match based on six loci; laboratory contamination was found both in a murder case in New Zealand and in the Jaiden Leskie case in Victoria, which caused police to investigate false leads in both cases. In Houston, Texas, after a review of the Police Department forensic laboratory, genetic testing was suspended in January 2003, and the 25-year conviction of Josiah Sutton for rape, which depended almost solely on DNA evidence from that laboratory, was overturned on 12 March 2003 following re-testing. Prosecutors ordered additional re-testing in the cases of 68 prisoners, 17 of whom were on death row in Texas resulting from DNA tests conducted by the same laboratory (Mabrey, 2003; Hart, 2003: 19). In mid-2004 the outcome of this retesting was still pending. In Las Vegas, a misidentification occurred through a labelling error resulting in a wrongful imprisonment (Puit, 2002: 1B). Defence counsel need to be aware of laboratory practices and auditing standards and where warranted, challenge these in court.

A further issue of concern for a number of laboratories in Australia is the backlog of samples held, particularly from volume crime. Delays of more than 12 months for testing were reported in Victorian DNA laboratories in 2002 (Shiel, 2002), while in New South Wales during Operation Vendas (refer Chapter 8) laboratory backlogs caused delays in the processing of samples (Jones and Weatherburn, 2004: 29). This situation reflected that in the UK during the first few years of database operation (Ross quoted in Western Australia, Legislative Council, 1998: 8). In Queensland by mid-2003, around 15,000 samples were awaiting testing (QHSS Annual Report, 2002-03). The CMC report attributed the increasing workloads to growing demand for services, incremental increases in resourcing, court-imposed time frames and the high cost of forensic technology (CMC, 2002: 24-25). In Victoria the reason was given as
the passing of legislation in 2000 that enabled widespread DNA sampling, but without corresponding funding to provide adequate infrastructure to manage the increased workload (VPLRC, 2004: 470-474).

The difficulties faced by laboratories can be illustrated with the Queensland case mentioned in Chapter 9 involving the rape and torture of a backpacker. The offences occurred in 2003 inside a deserted building frequented by intravenous drug users. In examining the scene, police scientific officers took over 300 separate swabs from blood spots on the floor. Most of these spots were residuals from the drug users, but with the necessity for thorough examination of serious crime scenes, they could not be ignored (Molinaro, 2003). Such cases are not exceptional.

The Australian position echoed on a smaller scale that in the United States, where by 2002, although the large majority of tests had been done, many were outstanding (Steadman, 2002: 1). According to an estimate by the National Institute of Justice (NIJ) on crime scene samples and prisoner samples in the US, in early 2003, “the current backlog of rape and homicide cases is approximately 350,000…the number of collected, untested convicted offender samples [was] at between 200,000 and 300,000…[there are] between 500,000 and 1,000,000 convicted offender samples that are owed, but not yet collected” (United States Department of Justice, 2003: 3-4; see also NIJ, 2003).

In 1999, Virginia, which had the first DNA database in the US, had taken positive steps to rectify its backlog of 120,000 samples collected from convicts. The State contracted with a private laboratory to profile about 8,000 samples per month, and estimated that this should clear the backlog in just over a year (Goodyear and Hallissy, 1999). By 2000, 45% of US laboratories reported contracting work out to the private sector, consisting of 204,359 convicted offender samples and 944 crime scene samples (Steadman, 2002: 1). The Queensland CMC report confirmed, “DNA and chemical testing could be performed in any laboratory, public or private, that has appropriate accreditation, facilities and staff” (CMC, 2002:25).
Another approach in dealing with the backlog would be for prosecutors to implement a statistically based case prioritising system. This would prioritise cases where DNA was predicted to make a difference to outcomes, while cases where it is calculated to have little impact would be posteriorised or not tested at all. From Chapters 4 to 7, case outcomes for different offence types, with and without DNA evidence, can be predicted with reasonable accuracy based on the case configurations. Appendix C provides examples of two sexual offence cases; one in which DNA is predicted to make a significant difference to the outcome, and the other where it makes little difference. A statistical predictive system is already used in the UK by Legal Aid to select cases for funding.

Because a shortage of qualified DNA scientists (termed “examiners” in the US) is one reason for the backlog, Canada and South Africa have turned to laboratory automation as a solution. Twenty-one staff in the Canadian Data Bank use robotic equipment to deal with an estimated 30,000 samples per year, compared to around 400 FSS staff in the UK processing 300,000 samples (Kerr, 2000: 21-28). South African laboratories, with limited funding, have sought to automate every stage of the DNA process that involved repetitive tasks. Behind this drive is the situation where that nation has experienced an unprecedented level of sexual assaults on children, resulting from a prevalent myth that HIV can be cured by sexual intercourse with a child. Frequently, DNA evidence is required to help solve these cases (NIJ, 2003: 3). The main UK Forensic Science Service laboratory in turn, with a staff of over 400, achieves economies of scale when compared to its counterparts in the US. The median number of personnel at the approximately 120 laboratories there is only six, and they faced backlogs in 2003 as described above (Steadman, 2002: 1). By 2004, the UK laboratory was achieving an average turnaround time for crime scene sample testing of three days (Sullivan, 2004).

**Infrastructure models for service delivery**

The major users of forensic services are law enforcement organizations, which usually delegate specialised services, such as in molecular biology, to outside agencies. A number of models exist in Australia and overseas for delivery of forensic services. These vary, and have either evolved or been designed depending on resources and
economy, local fiscal and political circumstances, efficiency, and the degree of separation deemed appropriate between the investigators and scientists. Models include health-governed models, police-governed models, mixed models and board-governed models (Crime and Misconduct Commission, 2002: 20-21). A 1985 survey of 257 crime laboratories in the United States found that 79% were located within law enforcement or public safety agencies. The remainder were associated with other organizations such as medical examiners’ offices, prosecutors’ offices, scientific or public health agencies, and other public or private institutions (Peterson, Mihajlovic and Bedrosian, 1985: 11). Later US surveys did not address this issue of infrastructure (Steadman, 2002).

**Health based models**

A health-governed model is used in New Zealand where a DNA Databank was set up in 1996 on the outskirts of Wellington following the *Criminal Investigation (Blood Samples) Act*, 1995. The New Zealand model is a Crown Research Institute, Environmental Science and Research Limited (ESR), which was founded as a commercial concern with an independent board of directors. ESR by convention has reinvested any surpluses in its own operations. New Zealand police negotiate annually with ESR, then determine their budget for forensic services and fund each police district accordingly (Harbis on, Hamilton and Walsh, 2001: 34). The advantages of such models are the relative independence of operation and autonomy of administration. On the other hand, scientists are distanced from investigators, reducing collaboration and communication, which may hinder effective outcomes. Funding problems may also arise if there is low demand for services, or if the market is competitive.

**Police based models**

Police-governed models are popular in some regions of the US, with partial models of this type in some Australian jurisdictions including Tasmania, the Northern Territory and the ACT. In Scotland, the forensic biology laboratories at Strathclyde and Tayside are part of the police establishment, allowing direct police control over budgeting and funding. This model allows for close liaison and coordination between investigators and scientists, but the impartiality of scientists in providing evidence
may be questioned. William Thompson, a professor of criminology, law and society at the University of California Irvine, commented on the role of the laboratory in a quashed wrongful conviction from the Houston, Texas, Police Department forensic laboratory, which was shut down in January 2003. He saw the problem as lying in human error and in the biases of forensic scientists who work for police agencies, and who might be under more pressure to make a match and not maintain the necessary neutrality:

I think it’s a service industry for law enforcement. They provide a service to clients, and the clients are law enforcement. Because of that, the culture that develops in police labs is inconsistent with upholding the best scientific values (Thompson quoted in Anton, 2003: 2).

A conflict of interests between the role of laboratories in providing intelligence for police and evidence for courts can also exist where there are backlogs. Supervising Magistrate Lisa Hannan, of the Criminal Jurisdiction Melbourne Magistrates Court, drew attention to this in evidence to the Victorian Parliament Law Reform Committee. She singled out for mention the Victoria Forensic Science Centre, which is situated within the Victoria Police:

It is obviously of concern to us as lawyers and the court that we have people whose cases we cannot progress because we are simply stalled by delays in forensic testing. If they [the Victoria Forensic Science Centre] have an ongoing investigation they will prioritise that work over people who have already been charged and are in custody (quoted in VPLRC, 2004: 472).

This tendency to favour police priorities rather than those of the courts, and access problems faced by defence lawyers in dealing with cases involving DNA evidence would more likely be accentuated in police owned laboratories. Police owned laboratories may also be subject to the perception of bias in the courts.
Mixed models

The consultation process for the implementation of Queensland’s DNA database incorporated input from the Queensland Police Service as sample collectors, Queensland Health as analysers, Corrective Services in relation to prisoner samples, the Justice Department in relation to court, the Families Department in relation to young people; Queensland Treasury for finance; the CrimTrac project for Commonwealth government involvement and external stakeholders like Legal Aid and Prisoners’ Legal Group (Stewart, 2002). The CMC report drew attention to how sharing of responsibility primarily between police and health agencies allowed for “the division of effort, specialisation and the placement of specialist staff in organizations able to support their professional needs” (CMC, 2002: 21). On the role of defence counsel, the report contained striking similarities to that of an earlier UK Royal Commission on Criminal Justice (1993). According to the Queensland Law Society, the impartial nature of expert evidence demands that access should be made available to forensic staff by defence counsel; that contact should be formalised as it is for the DPP; and that defence counsel be party to discussions with scientists (quoted in CMC. 2002: 23-24). However, such access has long been available to defence council (Freney, 2003) and it remains their responsibility to take full advantage of it.

Such models require co-ordination of activity and effective communication between agencies, and in Queensland an Interdepartmental Coordinating Committee exists to facilitate this. The Federal Privacy Commissioner, however, has pointed to the “risks in any multi-faceted system involving many agencies and regulators... for accountability processes to become piecemeal and ineffective” (Office of the Federal Privacy Commissioner, 2002: 49.1). Hence, individuals may not be provided with a clear understanding of how complaints, audits and investigations are handled and by whom. During this research one instance was found where a group had supplied DNA samples to eliminate them as suspects in a serial rape investigation, on condition that samples would be later destroyed, but their representatives were unable to obtain any assurances in reply to their inquiries about any destructions after the case had concluded.
**Board-governed models**

In the UK, a Management Board, the National DNA Database Board, administers The National DNA Database. According to the Chairman, Chief Constable David Coleman, since the Database Board “was set up in 1995 under the legal framework provided by the *Criminal Justice and Public Order Act* 1994, it has been overseen by a Management Board operated under a memorandum of understanding between the Forensic Science Service (FSS) and the Association of Chief Police Officers (ACPO)” (Coleman quoted in FSS, 2003: 4). Recently, with the Home Office DNA Expansion Program, representatives of the Home Office have joined the Management Board. The National DNA Database provides services to 43 police forces, with its major laboratory in Birmingham employing over 400 staff. Four other laboratories had approval in 2003 to carry out DNA analysis for The National DNA Database: Cellmark, LGC Limited and the two police laboratories in Scotland (FSS, 2003: 9).

The National DNA Database interacts commercially with police forces under a fee-for-service arrangement (Thompson, 1995: 20-24; Werrett, 1997: 35-37), initially charging £38.50 for the analysis of mouth swabs and by 1998 charging £210 for the analysis of each crime scene stain (Dovaston, 1996: 19; Gaule, 1999: 5). While lacking the financial security of laboratories integrated into funded government departments, board-governed models have greater perceived impartiality in the justice process, and can function as centres of good practice in forensic science (CMC, 2002: 21).

The CMC report on forensic science services in Queensland noted the tension generated by the different goals of police, health services and courts. While police used investigative practices to target individuals, “the public health system has a commitment to hospitals and non-crime related health care, while the courts rely on their own unique processes related to timely and informed decision-making” (CMC, 2002: 26). In addition, it is suggested that existing protocols for communication and coordination between UK police forces and the FSS be examined. In his 1987 report, Ramsay identified this aspect of the relationship as requiring improvement, and for the UK laboratory to handle its current caseload on behalf of numerous police forces, systems developed would necessarily be refined and sophisticated, despite initial
difficulties (Ross quoted in Western Australia, Legislative Council, 1998: 8). The CMC report made three recommendations on collaboration, coordination and communication between the QPS and the QHSS to improve operation and to enhance services. Additionally, the report considered “it may be worthwhile exploring other structural models to deliver forensic science services. There is evidence suggesting, for example, that the UK and New Zealand models operate effectively” (CMC, 2002: 25-6).

Alternatives models for adjudication: reform and radical change

The contribution of expert witnesses, including forensic biologists who provide testimony on DNA matches, was one issue considered for reform by the Law Commission of New Zealand (2004). In Delivering Justice for All, its vision for courts and tribunals, the Commission recommended that litigation should properly focus “upon those matters that are really in dispute, and identify early non-contentious areas without unnecessary time and money being wasted” (Robertson, 2004). Under the reformed system, DNA evidence, both in criminal and civil matters, could be discussed at pre-trial conferencing, and if common ground were agreed to by all parties, the necessity for adversarial contests about the evidence in the courts, and the appearance by scientists to provide evidence-in-chief and be subject to cross-examination, would be reduced.

The commission’s report made other recommendations for reform of the structure and operation of the courts, basing their findings on surveys and interviews with defendants, victims, witnesses, police, and court orderlies and security personnel. The Honourable Justice Bruce Robertson outlined the Commission’s approach:

This highly collaborative exercise involved not only judges, lawyers and administrators, but also significant interaction with ordinary citizens. It describes how many people find everything about Courts exhausting and alienating. They are not seen as an available place to seek justice. People feel so uncomfortable and unfamiliar that they cannot tell their story or enjoy the benefits that theoretically exist for all.
The three stage interactive process indicated that most people find what occurs is neither intelligent, intelligible nor inclusive. Difficulties which the judges and lawyers are thought to create are heightened when scientists become involved. They are seen as confusing and confounding (Robertson, 2004).

The presently used English-based adversarial legal system, which had its origins in mediaeval times and has since been evolving, has been criticized as requiring extensive revitalization and overhaul rather than mere reforms. Richard Dawkins, the initial holder from 1995 of a Professorship for the Public Understanding of Science at Oxford University, posited a radical alternative to the present justice process by drawing attention to the undeveloped use of science in law:

Not just in courts of law, the decisions of commissions of inquiries and other bodies charged with discovering what happened in some incident or accident frequently turn upon scientific matters. Scientists are called as expert witnesses on factual matters: on the technicalities of metal fatigue, on the infectivity of mad cow disease, and so on. Then, having delivered their expertise, the scientists are dismissed so those charged with the serious business of actually making the decisions can get on with it. The implication is that scientists are good at discovering detailed facts but others, often lawyers or judges, are better qualified to integrate them and recommend what needs to be done. On the contrary, a good case can be made that scientific ways of thinking are valuable, not just for assembling the detailed facts but for reaching the final verdict (Dawkins, 1998: 113).

One example where justice might benefit from the scientific approach under the present system would be to call for a report by forensic scientists on the likelihood of planted DNA evidence being detected, and any possible methods or procedures recommended for detection of such planted evidence. In general, while reforms recommended in New Zealand are an overdue step in the right direction, sufficient
motivation for any radical overhaul of legal procedures as suggested by Dawkins has not yet arisen in most jurisdictions.
RECOMMENDATIONS

The following recommendations arise from issues raised earlier in this chapter. The first section concerns legislation, while the second addresses remaining issues including suggested directions for future research. The thrust of the recommendations are to ensure adequate powers are available to investigators to apprehend criminals through forensic DNA use, but at the same time increasing the regulation of those powers to protect individual rights. The Victorian Parliament Law Reform Committee, in its report on forensic sampling and DNA databases, has also provided extensive and detailed recommendations (VPLRC, 2004: xvii-xxviii).

Legislation

1. “Non-coding” forensic DNA testing

The forensic analysis of DNA samples taken for investigative purposes should be specifically confined by legislation to the “non-coding” areas of the DNA molecule. Any other analysis of the DNA sample, particularly of the coding genes, should be explicitly prohibited. A prohibition should also apply to DNA testing in a forensic context to determine blood relationships unless specifically pertinent to the circumstances of a criminal case (Gans, 2003: 6).

2. Retention of profiles only and not samples

Forensic laboratories need only retain DNA profiles for comparison purposes and not samples. To foster public confidence in the system through the knowledge that samples can never be used for other purposes, they should be destroyed once profiling is completed.

3. Regulation of mass testing

Targeted testing of individuals, rather than mass testing of segments of the population, such as in cases of serial sex offences, should be a preferable first option for police. Computer programs like Dragnet or CrimeStat II can assist with such targeting and reduce investigation costs. Any targeted area or mass testing should then be subject to obtaining a warrant or court order specifying the area and/or the number of persons
to be tested. Such warrants should be reserved for serious offences such as serial crimes or crimes against the person. For a particular crime, a court order specifying a maximum number of people to be tested is suggested.

4. Covert sampling

Covert forensic DNA samples should be obtained either under warrant, or if collected in emergent circumstances, authorised retrospectively by a magistrate or judge before use in court. Any other such gathering should be prohibited. Any informal collection of a suspect person’s DNA sample other than prescribed under relevant legislation should be prohibited (Gans, 2003: 4).

5. Destruction of samples and profiles

External and internal audits of laboratories should be conducted by monitoring bodies like NATA, reporting to Ombudsmen or Privacy Commissioners at regular intervals, to confirm that destruction of samples and profiles is being carried out as required under legislation.

6. Guthrie cards

There needs to be an input of public opinion and a considered parliamentary decision about allowing the use of DNA from infant Guthrie cards or research volunteers’ tissue for law enforcement purposes.

7. Database monitoring

An independent, external monitoring of the DNA database that is simple and effective needs to be implemented or maintained at State and Federal levels. Public acceptance, confidence and support require guarantees of accountability with assurances that the database will be effectively and securely managed. In addition to laboratory testing by NATA, regular monitoring, auditing and reporting by independent authorities, such as by an Ombudsman adequately funded to do so, is required to prevent, detect or rectify any systemic non-compliance with database regulation, particularly in the area of privacy (OFPC, 2002: 48.1).
8. Containing “function creep”

External reviews of law enforcement functions that use genetic material need to be conducted at regular intervals to determine whether an extension of their functions (“function creep”) has occurred, or is about to occur. The Federal Privacy Commissioner has suggested that this be done every five years (OFPC, 2002: 9).

9. Post-conviction legislation

State, federal and territory legislation for post-conviction DNA testing should be introduced in Australia to facilitate the introduction of DNA evidence in the appellate and high courts (see Chapter 10).

Non-legislative recommendations and future research

10. Innocence Panels

Privately operated Innocence Projects or Panels, or ones based on the UK’s Criminal Cases Review Commission model, should be fostered and supported with sufficient government funding. They should be available to appellant representation such as by defence counsel and Legal Aid solicitors. This recommendation derives in part from the finding that officially constituted Innocence Panels in the US had achieved no exonerations (Lazer, 2003: 4).

11. Familial matching (partial matches with relatives) on databases

Guidelines that take into account ethics and privacy issues need to be provided to laboratories defining under what circumstances it is permissible to search DNA databases for partial matches, and under which conditions relatives of potential suspects could be approached as avenues for investigations.

12. Volume crime reduction and prevention

The directing of forensic intelligence towards reductions in levels of burglaries and car thefts, as was attempted by NSW Police Operation Vendas, should continue to be researched as a long term project. A complementary project would be structured
research to ascertain the specific and general deterrent effects, if any, of forensic DNA on volume crime, along with any consequent savings.

13. Meaningful reporting measures for effectiveness

Realistic measures of outcomes are recommended for evaluating and reporting purposes by law enforcement bodies. For volume crime, any reductions credited to forensic science can be measured by control-comparison methods while allowing for background changes over time. As a second preference, convictions achieved through DNA matches could be used. Laboratory match rates and numbers should be used for reporting laboratory performance only, as they do not necessarily reflect outcomes in the justice process.

14. Interaction between investigators and laboratories

Protocols for communication and coordination between investigators and laboratories in relation to exhibits and crime scenes may need to be examined to identify any possible areas for improvement.

15. Clarification of court vs. intelligence functions

The two roles of the forensic laboratory in providing intelligence for police and evidence for court should be clarified and differentiated in order to avoid, or at least minimise, any potential for conflict. This applies particularly in relation to the prioritising of the workload.

16. Improved access to scientists for Defence Counsel

Defence counsel access and communication with forensic scientists needs to be improved and formalised, possibly by the creation of a channel in the form of a liaison officer position.
17. Benefit-cost analyses

Studies to evaluate the benefits-costs of forensic DNA usage need to be conducted, as suggested by the Victoria Police’s *Tracing the Future* (2002). Such ratios may be useful for comparison purposes to decide effective allocation of resources among various crime management strategies.

18. Evidence integrity tests

Experimental or field exercises including use of standard procedures and “blind trials” should be conducted to test the integrity of crime scenes, laboratory and court systems against transferred DNA including amplicon contamination. Because of the ethical issues involved, monitoring bodies like Queensland’s CMC or the NSW Independent Commission Against Corruption (ICAC), in collaboration with scientists, may be best equipped to conduct and report on whether present routine crime scene examination and laboratory procedures would detect such tampering. This would be in addition to the present external quality controls exercised by NATA.

19. Court acknowledgement of DNA transferability

Appropriate acknowledgement should be made in court, in the context of the circumstances of the particular case, of the potential for DNA evidence to be transferred (Strutt, 2002: 4). Prosecutors and Defence Counsel need to be aware of this possibility. The latter presently bear the responsibility of asking the relevant question to scientist providing expert testimony, but where they omit to do so for no apparent reason, and if relevant, judges should inform jurors of the possibility in their summations.

20. Eliminating laboratory backlogs

Fast laboratory turn-around times are necessary if volume crime reductions are a goal, and expediency should be an expectation for justice. Where laboratory backlogs exist, methods found to reduce them successfully should be closely examined. These could include additional funding, automation, out-sourcing to private laboratories and use of the case prioritising system for prosecutors outlined in Appendix C.
21. Transparency about laboratory error rates

In the interests of public accountability, transparency, accuracy in court and justice, error rates in laboratories and in DNA prosecution systems should be researched and monitored with results disclosed to defence counsel. Improvements in procedures can then be implemented to minimise both the levels of such errors and the possibility of future wrongful convictions.

22. Consistent and effective complaint handling

An effective national monitoring system that handles complaints efficiently across the multitude of agencies and jurisdictions needs to be implemented. An organization such as the Office of the Federal Privacy Commission or the Commonwealth Ombudsman, perhaps in collaboration with NATA, should be provided with the necessary funding, staff and statutory powers to process complaints and ensure remediation of any deficiencies detected.

23. Improvements to procedures derived from studies of wrongful convictions

Reforms in procedures to improve justice and to guard the innocent against wrongful convictions through eyewitness identification, in methods used for interviewing child witnesses, and in the interrogation of suspects should be introduced where applicable. Examples to improve witness identification include using “double blind” identification parades and showing of photographs to witnesses consecutively rather than the use of a photo board. These measures have been put forward as a result of research in the US on cases where DNA evidence was used to prove innocence post-conviction.

24. Structural model for service delivery

The structures for forensic DNA service delivery in the Australian States may need to be examined to ensure that the models employed ensure autonomy from other responsibilities, provide both actual and perceived impartiality and are able to facilitate audits by privacy regulators. As a government-operated venture through the Health Department, the present Queensland laboratory is positioned in an organization primarily responsible for hospitals and public health care. Any
alternative model adopted would also need to recognize and balance the functions of providing intelligence information for police with provision of evidence for the courts. Both the UK and New Zealand models that are governed by boards of management have proved successful, and many of their structural features may be worth appropriating and adapting to local conditions.

CONCLUSION

This chapter sought to model a system that would balance privacy and civil liberties with the criminal justice goal of providing a safer society. The components of the system were identified as the law, procedures and infrastructure as applied to forensic DNA during its progression from the crime scene, through the laboratory and to the courts. Laws in Australia on sampling DNA from individuals were found to be generally more permissive than comparable laws in the United States or continental Europe. It was suggested that Australian laws on forensic DNA needed to be improved considerably and be made more comprehensive. The improvements recommended could strengthen police powers against crime while at the same time better safeguard privacy and civil liberties. Procedures at crime scenes and in the laboratory were then referred to. A number of infrastructure models for service delivery were compared and contrasted, followed by two suggested modifications to the present court process. Amended legislation was recommended to rectify existing deficiencies in the areas that included mass testing, covert sampling, database monitoring, post-conviction legislation and destruction of samples. Recommendations were also made to provide directions for further research, and on other non-legislative issues encountered during this research.
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APPENDIX A

Glossary of terms

Accreditation
Crime laboratories can be accredited for forensic testing. Accreditation of a crime laboratory means that the lab meets minimum professional standards for general operations.

Allele
One of two or more alternative forms of a gene or genetic marker.

Allele frequency
The relative occurrence of a particular allele, or gene form, in a population.

Antigen
A foreign substance, usually a protein, capable of stimulating an antibody response for body defence.

Anthropometry
The systematic recording of body measurements to identify criminals.

Cell
The basic building block of an organism.

Chromosome
The structure by which hereditary information is physically transmitted from one generation to the next; the organelle that carries the genes.

Circumstantial evidence
Any evidence in a case for which an inference is needed to relate it to the crime. Not observed by an eyewitness. Most physical evidence, with the exception of blood alcohol determination and drug identification, is circumstantial. DNA evidence is circumstantial.

Cleared Offence
An offence is deemed to be cleared under the following circumstances:

- The offender has been arrested, summoned, or information laid with a view to the issue of a process for the purpose of bringing an offender before court, for example, a warrant;
- The offender has been dealt with in accordance with Queensland Police Service policy, for example, cautioning of juvenile and elderly persons;
- The offender has admitted the offence but will not be charged due to circumstances, for example, the victim refuses to proceed or the offender has diplomatic immunity;
- The offender has died before a charge can be made;
- The offender has been committed to a psychiatric institution;
- The offender is serving a sentence of imprisonment and no useful purpose would be served by prosecution;
- The victim or an essential witness is deceased; or
- The victim has requested that the police take no further action.

**Clone**
A group of identical cells descending from a single cell.

**Coding region**
A region of DNA that has the capability of producing a protein.

**Crime Location**
The crime location is the initial site where a criminal incident occurred, classified by the primary function of that site where the site has more than one function.

**Deoxyribonucleic acid (DNA)**
The genetic material of organisms. It is composed of two complementary chains of nucleotides in the form of a double helix.

**DNA database**
A computer repository of DNA profiles.

**DNA profile**
Profile compiled from the results of DNA testing of one or more genetic markers.

**Electrophoresis**
A technique in which molecules are separated by their rate of movement in an electric field; in the case of DNA, the fragments are separated according to size.

**Enzyme**
A protein that is capable of speeding up a specific biochemical reaction but which itself is not changed or consumed in the process; a biological catalyst.

**Epithelial cells (e.cells)**
Cells such as skin cells, vaginal cells, or other cells normally found on an inner or outer body surface (see also Non-sperm cells)

**Eugenics**
The concept of improving the human race by selective breeding.

**Eukaryote; Eukaryotic**
A type of cell that contains a nucleus and various organelles, or an organism composed of such cells. Humans are eukaryotes.

**Evidence Sample**
Sample for which the origin is unknown; usually taken from the crime scene or
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exclusion</strong></td>
<td>Two samples that could not share a common origin, frequently a reference sample and an evidence sample.</td>
</tr>
<tr>
<td><strong>Gene</strong></td>
<td>The basic unit of heredity; sequence of DNA nucleotides on a chromosome.</td>
</tr>
<tr>
<td><strong>Genome</strong></td>
<td>The total genetic makeup of an organism.</td>
</tr>
<tr>
<td><strong>Locus (pl., Loci)</strong></td>
<td>The specific physical location of a gene on a chromosome.</td>
</tr>
<tr>
<td><strong>Membrane</strong></td>
<td>The support (usually nylon) to which DNA is transferred during the Southern blotting procedure.</td>
</tr>
<tr>
<td><strong>Mitochondrial DNA (mtDNA)</strong></td>
<td>The small, numerous, circular DNA molecules found in mitochondria.</td>
</tr>
<tr>
<td><strong>Mitochondrion (pl., Mitochondria)</strong></td>
<td>An organelle found in eukaryotes, including humans. Specific hypervariable regions of mtDNA are typed in forensic testing.</td>
</tr>
<tr>
<td><strong>Nucleotide</strong></td>
<td>A unit of nucleic acid. Technically, nucleotides are the raw building blocks of DNA or RNA. The term is often used informally in discussing the nucleotide “residues” left after the molecule is strung together.</td>
</tr>
<tr>
<td><strong>Nucleus</strong></td>
<td>An organelle found in the vast majority of eukaryotic cells, including most in the human body. It contains most of the cell’s genome.</td>
</tr>
<tr>
<td><strong>Number of Offences Cleared</strong></td>
<td>Cleared offences are presented in two groups, i.e., those that were both reported and cleared in the reference period, and those that were cleared in the reference period but reported previously.</td>
</tr>
<tr>
<td><strong>Offence</strong></td>
<td>For statistical purposes an offence is any act reported to or becoming known by the police, which they consider, prima facie, to be in breach of the criminal law. With the exception of murder, each offence count represents an actual offence, an attempted offence, a conspiracy, or the aiding or abetting of an offence. In the case of murder, these categories are distinguished.</td>
</tr>
<tr>
<td><strong>Offender</strong></td>
<td>An offender is any person who, through the clearance of an offence, is deemed to be responsible for committing that offence</td>
</tr>
<tr>
<td><strong>Offender/Victim Relationship</strong></td>
<td>The Offender/Victim Relationship only relates to offences against the person, and is recorded according to the victim’s perception of the relationship. In instances where there is more than one victim, the relationship of the offender to the primary victim is used.</td>
</tr>
<tr>
<td><strong>Organelle</strong></td>
<td>Any of the subcellular structures found in eukaryotic cells.</td>
</tr>
<tr>
<td><strong>Percentage Cleared</strong></td>
<td>Percentage Cleared is the percentage of offences that were reported within a specified period that were also cleared within that period.</td>
</tr>
<tr>
<td><strong>Phenotype</strong></td>
<td>The physical appearance or functional expression of a trait.</td>
</tr>
<tr>
<td><strong>Physical evidence</strong></td>
<td>Any evidence in a case that can be subjected to physical analysis.</td>
</tr>
<tr>
<td><strong>Polymerase chain reaction (PCR)</strong></td>
<td>A process mediated by a DNA polymerase that can yield millions of copies of a desired DNA sequence.</td>
</tr>
<tr>
<td><strong>Polymorphism</strong></td>
<td>The presence of multiple alleles of a gene in a population.</td>
</tr>
<tr>
<td><strong>Probe</strong></td>
<td>A short segment of synthetic, tagged DNA used to detect a particular DNA fragment or sequence.</td>
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<tr>
<td><strong>Protein</strong></td>
<td>A class of biological molecules made up of amino acids, proteins provide much of the body’s structure and function. Enzymes are a subclass of proteins that perform specific biochemical functions.</td>
</tr>
<tr>
<td><strong>Quality assurance (QA)</strong></td>
<td>The plan by which a laboratory can ensure that minimum professional standards for general operations are met.</td>
</tr>
<tr>
<td><strong>Reported Offence</strong></td>
<td>Reported offences refer to all offences reported to or becoming known to the police within the relevant reference period. Offences that are found after investigation to be not substantiated are excluded from the reported crime statistics.</td>
</tr>
<tr>
<td><strong>Restriction fragment length polymorphism (RFLP)</strong></td>
<td>Variation in the length of DNA fragments produced by a restriction endonuclease (an enzyme) that cuts at a polymorphic locus. The polymorphism can be either in the restriction enzyme site or in the</td>
</tr>
</tbody>
</table>
number of tandem repeats between the cut sites. Variable Number Tandem Repeat (VNTR) loci are used in forensic DNA analysis [see also Variable number tandem repeat (VNTR)]

RFLP analysis
A technique that uses probes to detect length variation in a specific region of DNA. The variation is caused by diff

Serology
The discipline concerned with the immunologic study of the body fluids.

Short tandem repeat (STR)
Repeating units of an identical (or similar) DNA sequence, where the repeat sequence unit is 2 to 5 base pairs (Bp) in length. The repeat units are arranged in direct succession of each other, and the number of repeat units varies between individuals.

Single-locus probe
A DNA probe that detects genetic variation at only one site in the genome; an autorad produced using one, single-locus probe usually displays one band in homozygotes and two bands in heterozygotes.

Southern blot
The technique for transferring DNA fragments that have been separated by electrophoresis from the gel to a nylon membrane.

Variable number tandem repeat (VNTR)
Repeating units of an identical (or similar) DNA sequence, arranged in direct succession in a particular region of a chromosome, for which the number varies between individuals.

Victim
The description of a victim varies according to offence type:
- For Homicide, Assault, Sexual offences, Kidnapping, Abduction and Deprivation of Liberty, and Other Offences Against the Person subdivisions, the victim is an individual person;
- For Robbery, Extortion, Arson, Other Property Damage, Stealing, (excluding Motor Vehicles), and Fraud, the victim may be either an individual person or an organisation;
- For Motor Vehicle Theft, the victim is the motor vehicle;
For offences of Unlawful Entry, the victim is the place/premise as defined on the basis of occupation/ownership
APPENDIX B

**FLINTS – Force Linked Intelligence System.**
An intelligence and investigative capability linking place to people to people to crime through forensic, crime and intelligence databases.

by Nick Tofiluk, Assistant Chief Constable (Intelligence), West Midlands Police, UK.

**Systems Interest.**

Of interest to personnel working in both criminal investigation and intelligence development seeking to provide operational decision-makers with value added information.

Of particular interest to intelligence specialists seeking retrospective or predictive relationships between offenders/associates, across crime types and places of criminal activity using large crime, offender and forensic intelligence databases through integrated GIS technologies.

**Abstract.**

FLINTS is a computerised evidence and intelligence development system with an embedded GIS capability that can bring together intelligence and evidence from many sources, allowing the user to marshal information and evidence in support of criminal investigations or intelligence developments. FLINTS is not just technology, it is built with the disciplines of information and knowledge management, discovery and investigation in mind. It allows the user to ask very wide and diverse questions about crime related issues they believe are important to them.

Traditional law enforcement intelligence systems use substance-oriented approaches, collecting evidence by reference to its’ source. There are DNA, Fingerprint, Photographic, Electronic Sensing/SigInt (satellite, telephone monitoring, radio monitoring etc), Human Intelligence (HumInt), Forensic drugs analysis, recorded crime and intelligence (CrimInt) systems etc. These systems can fragment intelligence and evidence into separate collection silos making collation and analysis a resource intensive exercise.

The advantages of rapid data retrieval from isolated collection systems are not sustained in the collation and combination phase of the intelligence process. The export of data sets to secondary technologies can be time consuming and complicated if the data models vary.

This limits intelligence production as relatively few personnel can access the disparate information sources, creating separate intelligence process for strategic, tactical and operational users and limiting the potential for the analyst to develop multiple hypotheses as to cause/effect or potential future scenarios.

FLINTS operates in real time (4 minute updates) taking data from a variety of operational systems, a real advantage for operational analyst. The system also taking a substance blind approach to evidence, concerned with both single source and combinatorial evidence and intelligence development which are both visualised and securely accessible. This allows the collection of literally any evidence and intelligence that may be of use in discovering things you do not know.
FLINTS is designed to manage evidence and intelligence about ALL crime types; it does not only support a traditional detection approach of looking at single or limited crime types but an expansive exploratory approach trying to link people to people to places to crimes.

Background.

The interest in crime and its underlying causes and facilitators continues to grow in large part due to the political pressures that mount; that see crime per se as serious destabilising influence upon neighbourhoods, communities and society in general by virtue of its growing extremism and volume.

A traditional view of serious crime is one characterised by single or serial events, its investigation assisted by the comparatively low numbers of offences and offenders that facilitate detection strategies through the identification of linked modus operandi or offender descriptions / characteristics. By definition, volume crimes (now becoming widely regarded as “serious” by their cumulative impact) are likely to be serial, opportunistic often similar in terms of location and targets, involving multiple offenders. As a consequence intelligence development and criminal justice investigation is made extremely complex due to the extensive offender, crime and place data and the potential combinations that could describe or explain crime events.

In the UK there is now significant interest as to the geo-spatial features of crime, in particular the role of place as a cause of crime thus offering opportunities to reduce it. Enquiry as to how place may influence or act as areal attractors for types and levels of criminal behaviour and how offenders interact in the context of offending networks similarly in the context of place and time is the fundamental of the criminal intelligence process.

The mass of volume crime data now available establishes an imperative for the intelligence process to develop a capability to understand the complex interactions of large numbers of crimes, offenders and locations. Whilst advances in technology have facilitated the storage and retrieval of mass data, systems have continually reinforced the “silo” categorisation of crime, offender and intelligence data. Integrated systems capable of revealing linkages between offenders, crimes and places that offer opportunities to identify prolific offenders, offending associations and their geo-spatial patterns of resultant crime have not emerged with similar rapidity.

The present operational reality produces reductionist research and intelligence strategies focusing upon relatively small numbers of information and evidential connections and often leading to the unwitting adoption of deductive approaches based upon hypotheses that reflect narrow assumptions about the nature of crime or unimaginative future scenarios that restrict the development of indicators of emergent patterns.

It is often perceived that the majority of volume crime offending within specific areas can be ascribed to relatively small numbers of individuals associated through structures whose terminology (teams, networks or gangs) shows little comprehension as to the interplays between offenders, places and crimes. Consequently intelligence assessments of crime networks are often described in terms of:

- A small core of well researched offenders with validated linkages between them, their crimes, but within a context of complex co-offender (or suspected co-
offender) and criminal connections within vaguely described geo-spatial contexts, or
• A large number of poorly researched offenders (and suspected offenders), the complexity of the network and their activities defeating real prospects of investigating their networked criminality to prosecution standards or developing an intelligence product that would identify options for prediction.

It is often assumed that offending connections are clearly hierarchical and related to an intelligently purposeful dynamic, a belief often inducing searches for key “players”. This can lead to individual prolific offenders being mis-assigned influencing or leadership roles within revealed or suspected relationships, resulting in disproportionate time being expended on intelligence and investigative strategies that have little true understanding of the co-offending and geo-spatial context within which they seek to operate.

If the criminal intelligence process is to produce products that add value to options to prevent or reduce crime, the capability must enable analysts and operational staff the opportunity to the identify and explore linkages and patterns created by the identification of associations between offender(s), crime(s)/crime types and location(s).

The systems development had led to discussion as to our organisation’s intelligence capability. There are four areas of interrelated concern.

• Forensic science data is expensive to collect (training, officer deployment, equipment etc), analyse and requires efficient management, both for business efficiency and in ensuring that lines of enquiry or intelligence analysis are rationally constructed. With regard to the former FLINTS provides a case management capability that allows recovered forensic data to be received allocated and tracked and rational links to be explored.

• How organisational “labelling” has necessarily meant that data has been is being collected in technology silo’s defined by organisational/legal typologies or by commercial interests. These may have unwittingly reinforced information silos by facilitating massively increased single typology collection and retrieval capabilities, which in turn may have meant that “cross-silo/system” analysis has become more difficult. The concepts of data warehousing, common data modelling and real time data availability are becoming of critical importance for intelligence professionals.

• The need to establish information technologies that make “cross silo” information available in real time, to the operational, tactical and strategic user without having to duplicate operations. This can support devolved decision making, more effective leadership and releases the potential for good ideas, leads or constructive speculation, upon which most intelligence led policing or intelligence tasks depend.

• The final area for potential exploration is the ability of systems like FLINTS to both use routine activity and crime pattern theories as an intellectual basis for systems design. At the same time the system is offering criminologists and analysts the opportunity to test theories through access to volume inter-linking crime/offender/victim/place/time data.
APPENDIX C

Case Prioritising System for Prosecutors and Forensic Laboratories

Prediction of Jury Verdict of Guilty in a sexual offence case:

Case 1 characteristics:
Complainant intoxicated at time of incident
Tangible evidence (injuries, bruising, forced entry to premises)
Defendant makes no statement to police

Without incriminating DNA evidence Probability 0.10
With incriminating DNA evidence Probability 0.79

Case 2 characteristics:
Complainant not intoxicated at time of incident
Tangible evidence (injuries, bruising, forced entry to premises)
Defendant consents to police interview

Without incriminating DNA evidence Probability 0.97
With incriminating DNA evidence Probability 0.99

Interpretation:
Case 1 would be tested prior to Case 2. In Case 1, incriminating DNA evidence is predicted to alter the verdict from an acquittal to a conviction, as the probability of a finding of guilt increases to be over the 0.5 threshold.

In Case 2, DNA testing is predicted to make little difference to the case outcome, so prosecutors may decide to proceed with the case without testing being done.

Note: The system correctly predicted 72% of case outcomes in a sample of 47 cases. For some case outcomes, the accuracy is high as 91%. The 28% of cases not predicted accurately are influenced by non-significant variables in the model, or by factors not taken into account by the statistical model, such as witness credibility, effectiveness of defence and prosecution counsel etc.
APPENDIX D

Ethical approvals and compliance

Approval for this research project was obtained from the Human Ethics Committee, Office of Research, Griffith University, from the Queensland Department of Health and from the QPS Ethical Standards Command. The QPS Police Information Centre (PIC) Management also gave conditional permission to access data for purposes of the research, subject to safeguards being implemented to ensure its security. For example, where case descriptions are sourced to reports from the Crime Recording Information System for Police (CRISP) no report number is included. In keeping both with conditions for these approvals and with the Criminal Law (Rehabilitation of Offenders) Act 1986, individual cases are referred to, with appropriate annotations, only if they have already been released through the media in the public domain. Alternatively, where specific cases are used as illustrative examples, they are obscured by way of pseudonyms or generalities to prevent identification. However, since the prime orientation of this research is towards drawing conclusions from statistical data, individual cases and anomalies are of lesser interest. Opinions expressed in this thesis are solely those of the author and do not reflect the views of any organization or institution, while any errors of commission or omission are also the sole responsibility of the author.