DNA AND HOMICIDE CLEARANCE: WHAT'S REALLY GOING ON?

by

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Abstract

DNA and Homicide Clearance: What's Really Going On?

By

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Homicide clearance rates in the United States have been dropping steadily since the 1960s. The literature on homicide clearance has yet to explore exactly what affect DNA evidence is having on the homicide investigation. As such, the increased use of DNA as an investigative tool in raising homicide clearance is hardly axiomatic. The current study examined homicides committed in Manhattan, New York, within the years 1996 to 2003 for the use of DNA evidence in making an arrest. An analysis was also conducted with an eye toward how useful DNA evidence could be - indicating that, via its current usage, the creation of large DNA databases of known criminal offenders will, at best, only marginally increase the homicide clearance rate. Further, independence tests, and logistic regression analyses detail how various forms of evidence are related to clearance; evincing relationships between high rates of clearance and subjective forms of evidence, and low rates of clearance and objective forms of evidence. The implications of these relationships may point to a larger phenomenon, The Corrective Effect, which may have contributed to the drop in homicide clearance experienced nationwide.

Acknowledgements

I would like to thank many members of the NYPD for their support and assistance in the completion of this study; Deputy Commissioner of Training, Dr. James Fyfe; Chief of Detectives, George F. Brown; Deputy Inspector, Gary R. Gomula; Lieutenant, Stephen G. Camardese; Lieutenant, James A. West; Sergeant Anthony D'Amico; Administrative Assistant Regina King; the Office of the Deputy Commissioner of Training, the Homicide Analysis Unit, and the Manhattan North and South Cold Case squads as well as the commanding lieutenant or sergeant of every NYPD precinct in Manhattan (There are simply too many of you to list). The interest, and open-mindedness all of you displayed in this project is a testament to the dedication you have to the people of New York and specifically to the victims of homicides.

Special thanks are in order to Dr. Michael White for agreeing to chair my dissertation committee after the passing of Dr. James Fyfe. Those were some pretty big shoes to fill (size thirteen I believe) – you did me a fantastic service.

Thanks also to Dr. Jennifer Groscup for her continued assistance with the various and ever-changing statistical needs of this project – not to mention Yoda like wisdom in times of serious graduate student stress: Look to the stars … shoot for the door.

… and last but not least, Dr. Dennis Kenney who assisted in providing guidance for this project from the very beginning - which I imagine must have been a little like watching a circus … on fire … during an earthquake. In the early days it would have been so easy to give up, or move on to an easier topic –

something you said in time I would come to regret. So, you made the chaos seem normal and that, in and of itself is a wonderful form of encouragement. I'm glad I stuck it out.

Dedication

Dr Fyfe,

I came to you with an idea …
you gave me a challenge.

This dissertation is dedicated to the living memory of Dr. James Fyfe: a man I was just getting to know; a man whose influence will never leave me. I came to Dr. Fyfe with an observation that had been rejected by some as 'fanciful' and 'improbable' -- two words Dr. Fyfe told me he'd become very accustomed to hearing in his career.

By applying a critical eye to the accepted cultural understanding of police use of firearms, Dr Fyfe established that "The primary purpose of the police is to protect life. All policy follows from that," and in doing so fostered the creation of firearm-related policies responsible for saving countless lives, both police and civilian -- policies that, to the surprise of many, did not lead to an increase in crime.

Solving the problems inherent within our justice system is a multifaceted endeavor, and it is a rare individual who can see though the process to what needs to be done regardless of the unpopularity of the idea. It is an even rarer person who inspires others to carry on such a critical tradition.

Dr. Fyfe, I am eternally grateful …

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Chapter 1: Introduction

Homicide clearance rates have dropped considerably in the United States since the early 1960s (BJS, 2002c; FBI-UCR, 2006; Regini, 1997; Wellford and Cronin, 1999). As the homicide clearance rate has been called "the litmus test" for the efficacy of homicide investigations (Simon, 1991) it would seem logical to deduce that police across the country are not doing as good a job solving murders as they used to. The establishment of DNA evidence and its analysis have increased the public interest in, and drawn considerable focus to, the police investigation process. On the one hand, DNA evidence has figured prominently in death penalty appeals or habeas corpus cases where the use of such evidence has on occasion led to the post-conviction exoneration of the defendant (Liptak, 2003). Conversely, media images and popular culture depict police using DNA much like sophisticated fingerprints to identify suspects and solve cases, both new and old, with scientific certainty (Jewkes, 2004). It is this scientific certainty which creates the greatest attraction to DNA evidence as an investigative tool.

Despite its potential, little is actually known about how DNA evidence is utilized by investigators at the pre-arrest stage of a homicide case. Indeed, we do not even know how often DNA testable samples are gathered or examined, and therefore become available to investigators. As such, it is unclear what, if any, impact this scientific evidence might be having on homicide investigations; much less how this potential might be enhanced.

Conventional wisdom proffers the idea that forensic evidence helps in solving homicide cases (Geberth, 1983; Gilbert 1993; Geberth, 1996; Lyman, 1999; Fisher, 2000; Inman and Rudin, 2001; Gaines & Kappeler, 2005). Thus, the negative association between the increased use of forensic analysis and the drop in homicide clearance rates seems counter-intuitive. However, this conventional wisdom assumes that the forms of evidence that were used *before* forensic evidence became available, were not as *good* at producing *clearances* as forensic evidence is today. The notion that forensic evidence could be having anything other than a positive effect on clearance rates runs counter-intuitive to conventional investigative thinking. However, the relationship between DNA and clearance has not been examined previously and therefore the possibility exists that conventional wisdom may be in error.

Prior Thoughts

There exists a dearth of research on the subject of homicide clearance. There are only seven studies which analyze homicide clearance specifically (Wolfgang, 1958; Reidel and Rinehart, 1996; Wellford and Cronin, 1999; Regoeczi, Kennedy & Silverman, 2000; Puckett and Lundman, 2003; Litwin, 2004; and Addington, 2006) – and only one of these provides a theoretical basis for their analysis (Litwin, 2004). As changes in homicide clearance have been detected in the last forty years it seems logical to infer that what is affecting the clearance rate has also emerged in the last forty years. One factor within homicide investigations that has increased over the last forty years has been the

forensic analysis of physical evidence from crime scenes (Geberth, 1996; Fisher, 2000).

None of the prior research and thinking on homicide clearance has examined the specific effect of forensic evidence on homicide clearance. However, Wellford and Cronin (1999) statistically examined homicide data from several cities throughout the United States and found that several procedural factors – factors found within the process of investigating the homicide – were positively correlated with a cleared homicide. This is significant because, although the variables analyzed by Wellford and Cronin do not point the way to any great investigative 'fix-it' for the drop in homicide clearance, they have paved the way for discussing changes in investigative procedures – things that the police can control.

From the Subjective to the Objective

Litwin (2004) and Puckett and Lundman (2003) both point out two competing perspectives in the discussion on homicide clearance; the use of discretionary factors, and the use of non-discretionary factors. Citing Donald Black's seminal work, *The Behavior of Law,* Litwin digests Black's assertion that some victims are less valued than others in society and therefore the police would not consider it as important to clear murders committed against those victims. Litwin points out that this notion has been dispelled by many studies which show that murders of victims whom Black believed were of lesser value have higher, or equal clearance rates to other groups (Litwin, 2004). In other

words discretion is a part of the homicide investigation, just maybe not in the way Black previously asserted.

Some forms of evidence are left open to interpretation, in both their veracity and their relevance, by the homicide investigator. Confessions, eye-witness identifications, and witness statements are all subjective in that they can be in error, or that they can change, or be changed over time (Cutler & Penrod,1995; Fabian, Stadler, & Wetzels, 1995). Further, the fluctuations found in confessions or eye-witness statements, whether believed to be true or not, must then be examined for relevancy within the given investigation. With subjective evidence like confessions or eye-witness statements both the veracity and relevance must be determined by the detective investigating the homicide.

Certain forms of forensic evidence cannot be changed over time – at least not at the investigative level. Arguments in courtrooms on the veracity of the forensic analysis of any given piece of physical evidence are frequent, but the expert's determinations disseminated at the investigative level are not subject to interpretation by the investigators (Geberth, 1983; Geberth, 1996; Fisher, 2000; Gaines and Kappeler, 2005) – the veracity is accepted, the only thing the investigator has to do is determine its relevance. Therefore, an analysis of how this shift from subjective forms of evidence, forty years ago, to the use of more objective forms of evidence, found today, seems like the logical next step in examining homicide clearance – a step that has not yet been taken.

The Rise of DNA

The first homicide cases to use DNA evidence in the course of the investigation or trial were in the mid-1980s (Morton, 2001). By 1996, evidence from 15,000 cases was referred to publicly operated DNA labs: in 1997 the number jumped to 21,000 (BJS 2000a). By the year 2000 that number was up to 25,000 (BJS, 2002a). Two-thirds of prosecutors' offices used DNA evidence during plea negotiations or felony trials in 2001, up from about one half in 1996 (BJS, 2002b). In 1998, ninety-eight percent of public labs were analyzing DNA for law enforcement agencies (BJS, 1998). The rise of DNA evidence in the prosecution of crime, homicide or otherwise, is beyond dispute. However, what is conspicuously absent from the data above is any indication of how DNA is being utilized at the pre-arrest stage of a homicide investigation – it is unclear if DNA is being used before or after an arrest has been made. As such, it is difficult to determine whether DNA is helping to clear cases or just helping to convict, or force a plea, once an arrest has been made.

To address this, and several other questions related to the use of DNA in homicide cases, the current study examines homicides committed in Manhattan, New York City, within the years 1996 to 2003 for the use of DNA evidence in making an arrest. An analysis is also conducted with an eye toward how useful DNA evidence could possibly be given the creation of large DNA databases.

The Corrective Effect

This study also seeks to determine if the increased use of objective forms of physical evidence – namely DNA – has served to prevent a significant number of arrests in cases where DNA is used. In other words, if the clearance rates of prior decades were achieved using forms of evidence that were more malleable in making arrests (i.e. eye-witness testimony, confessions), and there has been a gradual change over time to forms of evidence who's veracity cannot be challenged from within the investigative process (i. e. physical evidence), then it would be reasonable to expect a drop in clearance. It should also be noted, that if such an effect exists, then the drop in homicide clearance has been fostered by homicide investigators doing exactly what society wants them to do: vehemently following a trail of objective physical evidence when such physical evidence exists.

By way of metaphor, if one has to complete a task 'correctly' by getting 10 lumps of clay (10 individual pieces of eyewitness or confession evidence) through a round whole, the consistency of the clay makes this task relatively easy. However if one has to get 9 lumps of clay and one steel cube (the forensic analysis of a piece of physical evidence) through the same round hole then the task can only be nine-tenths complete. This steel cube has served to prevent the task from being completed.

It could also be that the environment in which homicide cases are cleared has drastically changed. Forty years ago, nine lumps of clay may have been enough to 'correctly' clear a homicide case. Today we may feel less comfortable

(and therefore less ‘correct’) making arrests in homicide cases without at least one steel cube making it through the hole: a sentiment that is not only beneficial to society (a greater probability that the right people are getting arrested) but also to the criminal justice system (DNA exonerations twenty years after a bad arrest do not bolster confidence). In short, these combined effects may be ‘correcting’ the arrest process in homicide cases by resetting both the standard and the environment in which homicide cases are cleared.

Further, if the above described “Corrective Effect” has influenced an increasing number of cases since the late 1960s, this may have contributed to the gradual drop in homicide clearance experienced nationwide. If objective forms of physical evidence are somehow linked to cases remaining open, then it is reasonable to deduce that these cases *could* have been cleared (albeit ‘incorrectly’ by today’s standards) in the absence of this physical evidence, as in the past. However, this previous clearance rate would not have reflected cases that today remain open due to the nonexistence of various forms of forensic evidence used more frequently today. In other words, it seems reasonable to test whether or not the “Corrective Effect” is exposing a certain amount of artificiality in the clearance rates of the preceding decades: we may have been making arrests, but without the level of certainty provided by new and increasing objective forms of physical evidence. Quite simply, the “Corrective Effect” may have reduced the clearance rate by eliminating a significant number of ‘incorrect’ arrests.

Research Questions

The drop in homicide clearance experienced in the United States over the last forty years is quite puzzling, given the development and growth of forensic analysis. How can we be solving fewer homicides every year if there has been an increase in the forensic sciences and practices surrounding the analysis of physical forms of evidence (NIJ, 2004) which are specifically designed to help us solve homicides? Conventional wisdom says there must have been a change in how murders are being conducted, or in the relationships or conditions which exist between victim and offender – both of which undoubtedly have happened to some degree in the last forty years[1]. Research evincing an increase in "stranger-to-stranger homicides" has been particularly salient (see Chapter 2). However, when looking for influences that have been both ubiquitous throughout the entire country and increasing incrementally since the 1960s, it would also seem prudent to examine the rise of certain forms of forensic evidence. As such the research questions this study seeks to examine, in relation to homicide investigations, are;

1) How often is DNA evidence available in homicide cases and how many investigations actually have an analysis of some DNA evidence available at the pre-arrest stage?
2) How is the use of DNA related to homicide clearance?
3) How are other forms of physical evidence related to homicide clearance?

[1] For a detailed discussion of these changes please see Zahn and Jaimeson (1997).

4) Could the “Corrective Effect” – the collective effect of the increased use of objective forms of physical evidence - be related to the drop in homicide clearance?

5) What forms of evidence examined within this sample of homicide cases are predictive of case clearance?

Summary of what follows

Chapter 2 will examine the prior research on homicide clearance in greater detail, substantiating the need for the present analysis. Chapter 3 will present the study’s methodology and the data collected from NYPD homicide case files from the years 1996 to 2003 in detailing the use of DNA evidence. Chapter 4 will provide an analysis and discussion of the availability, use, and impact of DNA in homicide cases in Manhattan from 1996 to 2003. Chapter 5 will address how DNA is related to homicide clearance in deference to other clearance related variables evinced through independence tests and the use of logistic regression analyses. Chapter 6 will provide a discussion of the limitations of the present study in deference to predicting homicide clearance, the role of DNA in the homicide investigation, the existence of the “Corrective Effect”, and other implications intrinsic to the conducted research.

Chapter 2: Prior Thoughts on Homicide Clearance.

A reported crime is determined to be cleared when an arrest has taken place, the arrestee is charged with the commission of the offense, and the arrestee has been turned over to the court for prosecution (FBI, 2004)[2]. As the second and third of these criteria follow axiomatically the first (the arrest) in homicide cases, the current study considers a homicide case to be cleared once at least one person has been arrested for that homicide.

As mentioned in chapter one, there exists a dearth of research specifically on Homicide Clearance – and what does exist seems to focus on circumstances surrounding the murder or homicide event (Wolfgang, 1958; Reidel & Rinehart, 1996; Regoeczi, et al., 2000; Litwin, 2004; Addington, 2006). Only one study has examined clearance in relation to investigative procedure (Wellford & Cronin, 1999).

Prior Research on Circumstances of the Homicide Event

Marvin Wolfgang (1958), in this seminal work conducted within the city of Philadelphia, examined the case files of homicides committed between January 1, 1948 and December 31, 1952. Wolfgang devoted an entire chapter to his discussion of unsolved cases and it should be noted that this chapter begins with

[2] Crimes can also be cleared as Exceptional and Justifiable. Exceptional clearances relate to circumstances beyond law enforcement's control that prevent an arrest from taking place (FBI, 2004). Justifiable clearances involve acts that are deemed to be justified and therefore not illegal under the circumstances provided (FBI, 2004). As such, Exceptional and Justifiable clearances are not relevant to the current analyses.

a discussion of a New England pathologist's recently expressed belief "that only one out of every 10 murders in that state ever is discovered, that it is 'easy to get away with murder in the state', and that it is 'a simple matter to dispose of a body'" (pg. 284)[3]. Wolfgang maintains that these statements may be exaggerations, but he also points out that certainly *some* other determinations of death (deaths due to natural causes) are in fact criminal homicides. Whatever the reality, these statements do provide a glimpse into the environment in which the homicide cases he examined were investigated – it was believed that many people were getting away with murder.

Wolfgang discovered many correlations between certain variables and the failure to "solve" a homicide case (Wolfgang, 1958). This was the first time in the literature that an assertion had ever been made that certain elements found at, in, around or in relation to a homicide could predict whether the case would remain "unsolved." Wolfgang (1958) found that unsolved homicides have higher portions of

1) white male and white female victims;
2) victims 65 years of age or over;
3) robbery motives;
4) victims who were strangers to their assailants;
5) beatings;
6) week-end slayings;
7) deaths occurring outside the home, and in the street (pg. 294).

When we examine the above list of variables with a subjective/objective lens it seems evident that only number 3 (robbery motives) and number 4 (victims who were strangers to their assailants) are not objectively determinable

[3] Wolfgang (1958) cites a *New York Times*, July 8, 1952 article.

before a suspect has been found. All of the other variables seem to be objectively observable from the moment (or very shortly there after) the homicide is discovered and they are all things that homicide investigators would have almost no ability to affect.

Further, in claiming that unsolved homicides are correlated with the motive of robbery, Wolfgang has made an assumption. If the crime is not solved, then how does anyone know what the motive for the crime was? Certain factors may be salient at the scene (for example a missing wallet or jewelry); however the possibility exists that the assailant may have doctored the scene to look like a robbery to cover his or her tracks. If this covering-of-tracks method had met with any degree of success, it may explain why a significant number of unsolved murders are linked to this motive. Had the police conducted their investigation via a different motive, maybe these cases would not be unsolved.

This same criticism can be made of the determination that unsolved cases have a higher proportion of stranger-to-stranger relationships. As above, the obvious concern with this assumption is that if a homicide is 'unsolved' then the relationship between the victim and the offender is, in fact, unknown. This is of particular importance in that this idea - that strangers can be attributed to a number of unsolved killings - has translated into a great deal of thinking about murder (Godwin, 1978; Hazelwood & Douglas, 1983; Douglas & Munn, 1992; Hazelwood, Dietz, & Warren, 1992; Canter, 1994; Douglas and Olshaker, 1995; Holmes & Holmes, 1996; Hickey, 1997; Jackson & Bekerian, 1997; Egger, 1998; Holmes & Holmes, 1998; Holmes, 1998; Rossmo, 1998). Disappointingly,

Wolfgang avoids a discussion regarding this assertion by simply stating (in a footnote) that the stranger-to-stranger association between victims and offenders in his sample of unsolved cases is “Strongly suggested, but, of course, not confirmed by the available data” (Wolfgang, 1958, pg. 294).

As the dataset utilized by Wolfgang predated any nationwide use of forensic evidence (or the current scientific standards found therein), it seems reasonable to deduce that subjective forms of evidence (i.e. eyewitness statements, eyewitness identifications and confessions) would have been the norm in ‘solving’ homicide cases found in Philadelphia, and indeed the entire country at that time.

One aspect of Wolfgang’s research, not often discussed, is the clearance rates his research produced. Wolfgang received, in response to a questionnaire he sent to eighteen cities in the U.S., clearance data for the years 1948 through 1952. Although these data are not as detailed as the data produced in coming years by the UCR, they still produce an estimate of what homicide clearance was like at that time. Wolfgang found that the average clearance rate of these eighteen cities from 1948 through 1952 was 90.1 percent – Philadelphia itself had an average clearance rate of just over 93 percent (Wolfgang, 1958).

Wolfgang (1958) also addresses a lot of the same concepts found in later research on homicide clearance.

> A high portion of unsolved homicides *may* indicate ineptitude of the police. On the other hand, a police force may be well organized, free of corruption, unusually efficient, and well trained; yet because of its being understaffed, fail to have sufficient time to investigate adequately all cases. To these factors that affect the proportion of unsolved homicides should be added: size and density of a

> community; prevailing mores regarding respect for law and authority; the extent to which the culture pattern ennobles the dignity and worth of individual human life; the degree to which members of the community have internalized prevailing culture values; the amount of internal and external pressure to confess (italics in original - pg. 285).

From this it can be argued that the issues and problems experienced by homicide investigators in working with the public then were as varied and problematic as they are today.

In summation it could be said, when examining Wolfgang's original chapter on unsolved homicides, that the homicide investigators in the 1950s were operating under a belief that 1) murder was rampant; 2) they had little more than confessions and eye-witness testimony to rely upon; 3) that concerns about police approval by the public and; 4) the public's belief in the sanctity of life, were all salient factors within homicide investigations - and yet the homicide clearance rate remained above ninety percent.

Reidel and Rinehart (1996) examined 3,066 Chicago murders, committed between 1987 and 1991, to investigate the "relationship of victim's age, race, gender, weapon, and circumstances to whether a murder is cleared" (pg. 84.) They found via a statistical analysis that "The single most important variable to predict whether a murder will be cleared was whether it involved a concomitant felony. Where the murder occurred in the context of a suspected felony, robbery, or rape, it was substantially less likely to be cleared than murders involving arguments or brawls" (pg. 97). In other words, the weapon used, the age, race and gender of the victim all had little or no predictive value.

Further, Reidel and Rinehart (1996) point out;

> The most important variables affecting clearances are community involvement with the police investigation and eyewitness testimony … With respect to clearances, murder is unlike other forms of violence because the victim generally cannot provide information. This means that information relevant to clearances must come from one or more of three sources: (1) the homicide setting; (2) the behavior of third parties; (3) investigative activities (pg. 85).

Homicide setting and the behavior of third parties are things that homicide investigators have little ability to affect – they are by-and-large out of the investigator's control. Investigative activities and/or investigative tack, on the other hand, the homicide investigator has total control over (Geberth, 1996; Fisher 2000). Further, Reidel and Rinehart (1996), while discussing the appropriate uses of the Supplemental Homicide Report of the FBI's Uniform Crime Report, point out the possibility that:

> The variables in this analysis can be placed in two categories. In one category are victim race, gender and weapon which can be frequently ascertained at the crime scene or from the reports of medical examiners. The second category – circumstances – consists of information that often needs to be obtained by further investigation (pg. 98).

It is not directly stated within their study, but it can be seen from the above quote that the time needed to conduct a 'further investigation' is an element directly connected to the need to determine 'circumstances.' In other words, they are pointing out that time is a commodity within the homicide investigation – a commodity which may be unrecoverable if it has been spent investigating the wrong 'circumstances.'

Regoeczi, Kennedy and Silverman (2000), noting that the drop in homicide clearance in the U.S over the last forty years is similar to the drop in

homicide clearance experienced in Canada over the same time period[4], analyzed homicide clearance rates in both countries. By examining victim and offense characteristics they found a correlation between some of those characteristics and homicide clearance in both countries as a whole – namely that homicides are likelier to be solved if the victim is a child (under 10) or the murder was not connected to another felony - a similar finding to Reidel and Rinehart (1996). They also found that some of these correlations disappeared when the analysis was brought to the state level (comparisons between New York and Ontario). These results are helpful in that they highlight the fact that different populations, in different cities are correlated differently with homicide clearance.

Further, Regoeczi, et al. (2000) undertook a comparison between the U.S. and Canada because they felt that the drop in clearance experienced by both nations may have a similar cause. This is germane to the present analysis in that if the use of forensic evidence is related to clearance in the U.S., then one would expect this relationship to also exist in other countries where homicides are investigated in a similar fashion and the use of forensic evidence has been comparable (like Canada).

The first factor of note discussed by Regoeczi et al. (2000) is the perceived increase in stranger-to stranger homicides - a theory that pervades most of the pre-existing discussion on homicide clearance. Citing two

[4] Regoeczi, et al., (2000), citing data from Cardarelli & Cavanagh (1992) and Silverman & Kennedy (1997) point out that cleared homicides in the U.S. dropped from 93% to 66%, and Canada's clearance rate dropped from 95% to 80% from the years 1961 to 1991 (pg. 135).

unpublished works and the proceedings of a 1995 conference about homicide[5], Regoeczi et al. (2000) feel comfortable drawing a conclusion about a significant number of unsolved murders – that they must have been committed by strangers. Specifically, Regoeczi et al. (2000), citing Riedel's 1995 unpublished manuscript, notes that in the United States there was a 12 percent decline (from 27 percent to 15 percent) in family-related murders between the years 1976 and 1989. As family-related murders are the "murders most easily cleared by arrest" (according to Regoeczi et al., 2000, pg. 137) – a statement made with no supporting citations - this 12 percent decline supports the idea that there has been a significant change from family-related murder to stranger-to-stranger murder in the United States.

However, Regoeczi et al. (2000) fail to address the fact that between the years 1965 and 1992 the United States experienced a 26 percent drop in homicide clearance (Regini, 1997). The attempt to establish a correlation between un-cleared homicides and a factor that *can only be determined* by clearing a homicide seems somewhat scientifically unsound - especially while using unpublished data taken from a time period in which this nation experienced its greatest drop in homicide clearance. If we as a nation went from solving 91 percent of our murders (in 1965) to 65 percent of our murders (in 1992), (Regini, 1997) - a timeframe inclusive of Riedel's 1976 to 1989 data - how can we say

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[5] Rinehart, T.A. (1994). *An analysis of murder clearances in Chicago: 1981-1991*. Unpublished master's thesis, Southern Illinois University, Carbondale.

Silverman, R.A., and Kennedy, L.W. (1997). Uncleared homicides in Canada and the United States. In M. Riedel & J. Boulahanis (Eds.), *Lethal violence: Proceedings of the 1995 Meeting of the Homicide Research Working Group* (pp. 81-86). Washington, DC: Office of Justice Programs, U.S. Department of Justice.

Riedel, M. (1995) *Questions and answers about murder*, Unpublished manuscript, Southern Illinois University, Carbondale.

anything, one way or another, about the rise or fall of any factor that can only be determined upon making an arrest? Unfortunately as Riedel's work is unpublished, and Regoeczi et al (2000) make no critical assessment of Riedel's assertions, it could be that the determination that there has been an increase in stranger-to-stranger homicides is more of a judgment, than a scientifically derived conception. Either way the resolution of this issue is left wanting.

The five hypotheses tested by Regoeczi et al. (2000) all contain variables which cannot be affected by those investigating the homicide (Gender, Race and Age of victims, use of a firearm, and occurring during the commission of another offense). As such this study avoided any discussion of how the homicides were investigated and whether or not aspects of the investigation were a factor related to clearance.

Puckett and Lundman (2003) analyzed factors affecting homicide clearance via data collected from homicides in Columbus, Ohio from 1984 through 1992. The analysis they conducted supported five conclusions.

> First, murders in African American neighborhoods have lower clearance rates, and we believe this is because citizens in African American communities have less trust in police and therefore provide police with less information. Second, and consistent with previous research, we find no clear evidence that direct measures of extralegal factors such as victim race affect homicide clearances. Third, we also find no support for arguments that detective experience and workload affect homicide clearances. Fourth, we do find evidence that the visibility and seriousness of homicide and the singular importance of homicide clearances combine to cause homicide detectives to work aggressively to clear all homicides irrespective of the places where they occur and the characteristics of homicide victims. Last, there is clear need and ample scholarly room for additional research on the factors affecting homicide clearances (Puckett & Lundman, 2003, pg. 189).

On the way to drawing their third and fourth conclusions, Puckett & Lundman (2003) make several very relevant observations about the workload of those who investigate homicides. This will be addressed in the following section – *Prior Research on Investigative Procedure*. Further, in discussing 'extralegal' factors (the second of their five conclusions) which affect homicide clearance, Puckett & Lundman (2003) are in agreement with the observation provided in the present analysis (above) of Regoeczi, et al.'s (2000) article – that certain factors, like motive, (and by inference victim and offender relationship) cannot be determined in an unsolved homicide.

What is of direct relevance to the current study is an observation made by Puckett & Lundman in evaluating the research presented above (and below). They state that this previous research taken in concert "suggests that homicide clearances rise or fall on the amount of physical evidence created while committing the murder" (Puckett & Lundman, 2003, pg. 175). Puckett & Lundman (2003), relying on the Locard Exchange Principle[6], claim that the use of weapons that promote close physical contact leave behind more traces of physical evidence for the police to find and therefore produce higher clearance rates. The authors avoid a discussion of the most likely criticism of this theory – that increased physical contact also increases time and therefore the likelihood of witness involvement – but their assertion is very surprising given the findings of the current study.

[6]"In short, it is not possible to come in contact with an environment without changing it in some small way, either by adding to it or by taking something away from it. This concept of transfer is the so-called Locard Exchange principle and is the basis for a study of trace evidence" (Fisher, 2000, pg. 161).

Litwin (2004) analyzed the Chicago Homicide Dataset, an archival source "which contains information on each homicide reported in Chicago, Illinois from 1965 through 1995" (pg. 62). Data from the years 1989-91 were analyzed via Hierarchical generalized linear modeling (HGLM).

Litwin (2004) examined factors affecting homicide clearance which are primarily "nondiscretionary" – most notably the victim's body location, the weapon used, the circumstances of the homicide and the population of the area in which the homicide occurred. Borrowing from Black's (1976) theory on valued and non-valued members of society, Litwin examined these homicide cases to determine if cases involving "non-valued" members of society had a lower clearance rate – the idea being that the police could exercise discretion in the effort exerted in solving cases and therefore would not expel as much energy in solving the murder of a "non-valued" member of society. Although his examination does not support Black's theory, Litwin did find that certain factors which the police had no control over – no ability to interpret on their own – were predictive of a case remaining uncleared.

What is of importance, in deference to the current study, is Litwin's definition of "non-discretionary" and "discretionary" in relation to homicide investigations. Litwin (2004) lists certain variables as having a non-discretionary status: concomitant felony, victim age (both under 10 and over 65), body location, area-wide adult educational attainment and educational expenditure, racial make-up of educational attainment, income, employment, and residence. He then concludes "The homicide clearance literature appears to indicate that

only nondiscretionary factors affect homicide clearances" (Litwin, 2004, pg. 334). He then describes the discretionary variables that he wishes to test as 1) the gender of the victim, 2) the race of the victim, and 3) the prior arrest record of the victim (Litwin, 2004). Clearly those investigating homicides can make decisions regarding myriad variables other than the age, race, and prior record of the victim during the course of an investigation (i.e. truthfulness of a witness statement or confessions seem far more salient). This is of little import to Litwin as his study is designed to test Black's theory of "valued" vs. "non-valued" bias on behalf of law enforcement. However, the operationalization used by Litwin is so specific to Black's theory that his data seem of little use in testing, researching, or analyzing other hypotheses or issues regarding homicide clearance. In other words, even though Litwin's analysis was originally reliant on the idea that "only factors beyond police control should shape homicide clearances" (pg. 331), his research seems to support the idea that the more subjective the evidence used in a homicide case (whether Litwin feels its "discretionary" or not) the greater the chance the case will be cleared.

Addington (2006) examined homicide clearance data provided by the National Incident Based Reporting System (NIBRS). In this research note, Addington tests the utility of NIBRS data against the previous standards in homicide clearance data, the Uniform Crime Report (UCR) and the Supplemental Homicide Report (SHR) of the Federal Bureau of Investigation (FBI). As Addington's focus is on testing a new dataset[7], her focus remains set on

[7] Addinton notes that the NIBRS data she examined represent homicides reported by law enforcement agencies which cover only 17 percent of the U.S. population.

comparisons between NIBRS and the UCR/SHR. This is relevant to the current research in that clearance via the UCR can be determined only as a rate – the UCR does not allow for extending the analysis of any one cleared case to specific elements within that case. The SHR does allow for specific analysis of factors related to any given homicide case, however it does not record the clearance status of that case. In other words, to effectively use UCR and SHR data to discover elements related to homicide clearance, one must rely on proxy-measures to determine whether the case has been cleared – most notably the existence of any suspect or assailant information. This, of course, is problematic as there are several ways in which a case may warrant the recording of suspect or assailant information but the case could still remain un-cleared. However, by analyzing NIBRS data Addington's findings are consistent with other clearance research.

> Analysis of NIBRS data suggest that factors related to evidence play an important role in predicting clearance, considering that knives and contact weapons as well as home location are associated with clearance. These findings are consistent with prior studies by Puckett and Lundman (2003) and Wellford and Cronin (1999), both of which used actual clearance measures collected from police records (Addinton, 2006, pg. 148).

Thus Addington (2006), while showing a great value to the use of the very limited NIBRS data, supports the notion that clearance research is most educational when conducted on data collected from original police records.

Prior Research on Investigative Procedure

Wellford and Cronin (1999) examined 798 homicides that occurred in four large U.S. cities during 1994 and 1995. The study was conducted in four parts, only the last two are relevant here: a logistic regression analysis, and statistical regression models created from correlations between variables and the solving of a case. The instrument used was the Homicide Attribute Coding Instrument (HAC) which consisted of over 220 variables covering over a dozen general topics relevant to the solving of a homicide case. They found that approximately 55 of the variables they tested were positively correlated to a cleared homicide and more than a dozen of those 55 were procedural in nature.

Several of these procedural variables have to do with first responder activity. They found that:

> The probability of clearance increases significantly when the first officer on the scene quickly notifies the homicide unit, the medical examiners, and the crime lab and attempts to locate witnesses, secure the area, and identify potential witnesses in the neighborhood (Wellford & Cronin, 2000, pg. 6).

The data they collected also indicate that the number of detectives assigned to the case, the time in which they arrive at the homicide scene, and the use of computer databases of various types were also strongly correlated with clearance (Wellford & Cronin, 1999).

Wellford and Cronin (1999) begin their analysis by stating:

> In the past, homicide was thought to be primarily a crime of passion involving family members or close acquaintances. These social relationships and the way in which the crime was carried out made it quite easy to identify the alleged offender. This, in turn, led to higher rates of clearance. In

> recent years, however, homicides have more often been stranger-to-stranger crimes and have involved more activity in the illegal drug market. Stranger-to-stranger crimes and drug market-related homicide are expected to have much lower probability of identifying alleged offenders; therefore, clearance rates will be lower (pg 3).

As with Wolfgang (1958) and Regoeczi (2000), Wellford and Cronin seem comfortable making the assertion that a large number of open homicide cases must have been committed by strangers and therefore those murders are harder to solve which is why they remain uncleared. They accept the idea that when an investigation has eliminated all other logical avenues of connection between possible suspects and the victim(s) then the homicide must have been committed by a stranger. However, Wellford and Cronin note, of their own research, that:

> Drug Cases continue to be the most difficult for police to solve, but the results of the homicide clearance study show that even in drug cases, police response can lead to an arrest (Wellford & Cronin, 2000, pg. 6).

From this it seems that Wellford and Cronin may be acknowledging a weakness in the previously stated belief that stranger-to-stranger murders are harder to solve – it could be that police response time (a variable to a certain extent controllable by the police), or what they do when they arrive, may assist in clearing a significant number of stranger-to-stranger murders.

Puckett & Lundman (2003) draw two conclusions which are directly relevant to police investigative procedures in their analysis of homicide data from Columbus, Ohio. First, detective experience and workload do not affect homicide clearance. Second, the “visibility and seriousness of homicide and the singular importance of homicide clearances combine to cause homicide detectives to

work aggressively to clear all homicides irrespective of the places where they occur and the characteristics of homicide victims" (Puckett & Lundman, 2003, pg. 189). Puckett & Lundman (2003) felt this was an area to examine as they noted other police duties provide many avenues for evaluation (e.g. writing tickets, misdemeanor or other felony arrests), but homicide investigators are left with only one course of evaluation – the homicide clearance rate. As such, Puckett & Lundman (2003) wanted to test how such a motivator to complete an investigation would be affected by other 'extralegal' factors (such as victim race or place of residence).

This is of particular importance to the present analysis in that it supports the idea that the conscious legitimate effort on behalf of law enforcement could be the fuel behind the effect of unseen changes in investigative decision making. In other words homicide investigators are probably doing exactly what we want them to do – vehemently following a trail of physical evidence. This trail of physical evidence may simply be much better at keeping 'incorrect' arrests from happening than it is at providing new avenues of investigation – suspects are no longer subject to arrest outside of an objective standard of evidence presented by the use of physical evidence.

Why DNA Evidence and Clearance?

The *use* of DNA evidence is on the rise (see Chapter 1). However, *how* this evidence is being used has yet to be examined in relation to homicide clearance. Research into another violent crime has already found that DNA evidence does prove to exclude from suspicion the tested suspect in a significant

number of cases. When studying sexual assault the Department of Justice noted that in one-quarter of sexual assault cases referred to the FBI, the primary suspect had been excluded by forensic DNA testing (NIJ, 1996). Further, the report concluded that:

> The fact that these percentages have remained constant for 7 years, and that the National Institute of Justice's informal survey of private laboratories reveals a strikingly similar 26 percent rate, strongly suggests that postarrest and postconviction DNA exonerations are tied to some strong, underlying systematic problems that generate erroneous accusations and convictions (NIJ, 1996, p. xxvii).

As such it seems likely that a "Corrective Effect" has already been documented within cases of sexual assault and there is reason to believe that the same or similar systematic problems may be found in homicide investigations as well (in fact, given the absence of a victim statement in a homicide case this effect could be much greater).

Homicide Clearance, DNA and the Corrective Effect

The Corrective Effect assumes that DNA evidence is used in a significant number of homicide investigations and that its use has been increasing over time. That is, if the specific need that DNA evidence fills in an investigation only appears in a statistically insignificant number of cases, then belief in the efficacy of DNA use should be tempered. Further, if it seems evident that DNA proves to free more suspects then implicate, the effects to the investigative process could be staggering. Accusations have already been leveled at various prosecutorial agencies for not analyzing available DNA samples in cases where such evidence exists: prosecutors seem to feel that if they already have enough evidence to

convict, there seems little reason to risk producing evidence favorable to the accused (Sessions, 2003).

DNA evidence can confirm certain realities within a crime scene that other forms of evidence may not. For instance a fingerprint, or footprint, is just that – a print left behind by someone at sometime (Geberth, 1996, Fisher 2000). But given the nature of certain physiological fluids from which DNA is taken (Semen, Amylase, Blood) a much greater level of suspicion may immediately be apparent. For example, if there is found a strangled female body, nude with semen present, the DNA extracted from that semen would be very condemning to the donor. The same would be true for a homicide involving a victim found stabbed in the course of a long drawn-out physical altercation in which DNA foreign to the victim was found in the blood taken from the crime scene. However, if fingerprints were to be found at these same crime scenes, the time and circumstances under which those fingerprints were left would still need to be established by other investigative means (Geberth, 1996, Fisher 2000).

DNA evidence may also require other investigative means to establish relevance (for example in cases of intimate partner killings, DNA found at crime scenes shared by both the victim and the suspect may have little probative value). However, DNA evidence certainly will present cases in which the above mentioned objective condemnation of one individual, and only one individual, exists. Even with the use of fingerprints found on something as condemning as the murder weapon, the possibility still exists for a small amount of subjective interpretation as the current standard of fingerprint analysis clearly states that the

absence of fingerprints means nothing[8]. Therefore, if an investigator had one subject's fingerprints on a murder weapon and another subject's confession to killing the victim, he would need to find other evidence, or make a subjective determination regarding which individual is responsible. Clearly DNA evidence would overshadow any other form of evidence in guiding an investigation – no detective would decide that a properly constructed DNA analysis would fall secondary in interpretation to eye-witness information or even a confession[9].

A much more serious problem with the use of DNA is the time needed to process the samples discovered at crime scenes. A recent study by Pratt, Gaffney, Lovrich and Johnson (2006) found that the:

> Adjusted numbers of homicides, rapes, property crimes and other cases with possible DNA evidence from law enforcement agencies and state and local crime laboratories, there are currently as many as 542,723 unsolved homicide, rape and property offense cases for possible DNA analysis known to law enforcement agencies and crime laboratories currently extant in the United States (Pratt, et al., 2006, pg. 38).

Pratt, et al. (2006) also estimate that over 96,000 of those 542,723 unsolved cases are homicides. As such an analysis of exactly how useful the processing of those 96,000 samples could be in raising homicide clearance seems cogent. Whatever the reality of DNA evidence at the investigative level, it seems clear to Pratt, et al. (2006), that the current backlog is a primary reason DNA is perceived by many to be a 'trial tool' and not very effective at the investigative level.

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[8] "Of course, it must be remembered that 'absence of evidence is not evidence of absence.' Just because a latent print is excluded as being that of the suspect doesn't mean the suspect did not touch that surface" (Wertheim, 2004, pg. 1).

[9] Consider the recent case of John Mark Karr, whose confession to the killing of JonBenet Ramsey was rejected after DNA tests failed to link him to the crime scene (Wikipedia, 2006).

Summary

The research discussed above makes certain realities about homicide clearance apparent. First, the homicide clearance rate has dropped by nearly thirty percent over the last 30 years, and the reasons for this drop are unknown. Second, by examining specific characteristics of the murder, murderer, or victim we can learn about what factors are related to homicide clearance in a specific area (Chicago seems to be over-represented in the above research). Third, prior thinking regarding the number of unsolved cases that can be attributed to stranger-to-stranger and drug-related killings may be spurious – if the case is unsolved then we don't know the nature of the victim-offender relationship. Fourth, a certain form of forensic evidence, namely DNA, has served to exclude from suspicion a significant number (25%) of suspects in sexual assault crimes. Lastly, evincing the use of DNA evidence within the homicide investigation will provide invaluable information about the possibilities DNA may hold in relation to the homicide clearance rate.

Considering the literature on homicide clearance, the need to explore the prevalence of DNA at the pre-arrest stage of homicide investigations seems clear. Further, if in reality the use of DNA has served to correct an artificial clearance rate then the belief in the efficacy of DNA should be tempered, the clearance rate (in its current form) should not be used to evaluate homicide investigations, and the police should be lauded for doing exactly what society expects of them – vehemently following the evidence they believe will most likely

identify the correct perpetrator. In short the possibility of the Corrective Effect's lowering of the homicide clearance rate makes clear the need to examine the effect DNA is having on homicide clearance. Lastly as the studies discussed in this chapter represent the body of literature on homicide clearance there seems ample room to also explore what factors, including DNA, predict homicide clearance.

Chapter 3: Data and Methods

To research the connection between the use of DNA and a successfully cleared homicide, an analysis was conducted on homicide case files within the Borough of Manhattan, New York City, between the years 1996 and 2003. Case files were selected after an extensive examination revealed how many cases had a forensic analysis of viable DNA evidence available before making an arrest. Then an analysis of exactly how DNA was used in each investigation was conducted with respect to 223 other variables (described below) relevant to homicide investigations (Wellford and Cronin, 1999). Lastly, a logistic regression was used to evince what variables were most predictive of case clearance within the data examined.

The Data

The Borough of Manhattan is uniquely suited to this study as the population of Manhattan represents not only dozens of different cultures, but also myriad socio-economic-strata, ages, and many other demographics which make Manhattan a microcosm of American life. As Manhattan is one of the most densely populated areas in America, it would be logical to expect issues in crime exacerbated by population density to be very apparent. Further, the transient nature of those residing in parts of Manhattan would suggest a greater number of stranger-to-stranger crimes: crimes in which previous research (see Chapter 2) has indicated DNA evidence would figure more prominently. Also, one would

expect the experience of Manhattan homicide detectives[10] to be among the most erudite in the profession owing to the number of homicides which occur in New York City as well as the NYPD's resources and reputation in law enforcement. As such, an analysis of homicide cases from this Borough can arguably be applied to almost any large metropolitan area in America.

Data Collection

This research began with the Homicide Analysis Unit of the New York City Police Department. Records obtained there indicated that there were 1037 homicides within the Borough of Manhattan between 1996 and 2003. The year 1996 was chosen as a starting point after discussions with Forensic Investigation Division staff indicated that DNA was not widely used by the NYPD as an investigative tool until then. Over the Spring, Summer and Fall of 2005, the Principal Investigator (PI) conducted an exhaustive search of all police precincts (file rooms, cold case squads, desk tops and broom closets) within the Borough of Manhattan. Out of the 1037 case files sought, 10 were determined to be incorrectly recorded (they in fact were not homicides) and 80 of the located files were cleared as "Exceptional" or "Justifiable" – both designations irrelevant to the present analysis. This was determined as the issues being examined here are not legal concerns of 'what is a homicide?' but instead issues of 'who killed the victim?' and how that question is determined. An analysis of changes in how

[10] Point of fact - At this time NYPD does not employ 'homicide detectives' per se. The current organizational structure simply assigns detectives to precincts. If a homicide occurs in that precinct it is assigned to one of the presently assigned detectives.

homicides are defined may yield results in discussions of clearance issues. However, this is not the concern of this analysis.

Out of the remaining 947 case files, 354 (or 37.4%) were unavailable (Figure 1, Chapter 4), however their clearance rate was still determinable via the information provided by the Homicide Analysis Unit of the NYPD. Cases were determined to be unavailable for myriad reasons: the case file was with the prosecutor's office as the case was in or near trial, the file was in transit between various departments, or the file was needed in conjunction with other on-going investigations.

Each file that could be located was then examined for information regarding the collection and examination of DNA evidence. This was determined by examining any found property invoice (sometimes called a 'Voucher'), which is necessary in commencing any serological analysis by the two agencies responsible for all serological analysis requested by the NYPD (The Forensic Investigation Division [FID]of the NYPD and the Office of the Chief Medical Examiner [OCME]).

By examining this request for serological analysis in conjunction with the date of arrest (found on follow up reports) and the presence of any report regarding DNA analysis it was possible to determine whether or not the detectives investigating the murder had 1) found or considered DNA relevant to the investigation, 2) requested any DNA analysis, 3) had that analysis available to assist them (i.e. implicate a tested suspect) when and if they made an arrest, or 4) used that analysis to exclude someone (i.e. failed to implicate a tested

suspect) from their investigation, whether an arrest was made or not. It should be noted, in deference to the use of DNA (3 and 4 above) that the implication or failure thereof provided by a DNA analysis does not necessarily constitute inclusion, or exclusion of a suspect in any given investigation. However, clearly a failure to implicate a suspect via DNA analysis would not serve to assist in the arrest of that suspect. Therefore, a failure to implicate would at least provide no helpful information and at most clear a suspect of all suspicion. In other words a corrective effect would have at least fostered the failure to gather further helpful information, and at most freed someone who was incorrectly suspected.

Therefore, each case was assigned one of four DNA Case Model Designations (DNA CMD): DNA CMD-1, DNA is determined not to be a factor in the investigation: DNA CMD-2, DNA analysis was requested, but not conducted: DNA CMD-3, a DNA analysis was available in the investigation prior to an arrest: or DNA CMD-4, a DNA analysis failed to implicate at least one tested suspect. Cleared and open cases (the clearance rate) for each category is then calculated and used in exploring the efficacy of DNA evidence in clearing homicide cases.

Random samples generated from within the remaining case files resulted in the generation of two control groups of equal size. Seventy-two cases from each of the two control groups, DNA Case Model 1 and DNA Case Model 2, were randomly selected. In the interests of representative comparisons, the clearance rate of DNA Case Models 3 and 4 combined was matched in selecting the random samples of DNA Case Models 1 and 2 – the percentages of open and closed cases in each of the three groups was made to be equal. This was

done as the main concept to be tested with these data was clearance and factors related to clearance. Once the case models were defined and the cases selected the coding process began on the selected 184 cases. Nothing about this study required the identification of anyone involved and to that end, no victim, suspect, witness, officer, or detective information was recorded in any way.

Instrument

The instrument used in coding the 184 files in the selected sample was a modified version of the Homicide Attribute Coding (HAC) instrument developed by Wellford & Cronin (1999). This modified version of the instrument (the HAC-M) examines 223 variables found to be relevant in past research on homicide investigations (Wellford & Cronin, 1999). The instrument was modified from its original form as the 223 variables used were discussed with the relevant units of the NYPD and provide information germane to the relationship between the victim and offender, motivation for offense, number of offenders and victims, weapon(s) used, race of victim and offender, drug and alcohol usage, location of murder, the intervention of emergency medical personnel, the presence of other physical evidence, gang involvement, and the time between offense and arrest.

The HAC-M breaks down the 223 variables into 21 separate groups which are arranged by subject (Appendix A). After conversations with the Forensic Investigations Division of the NYPD it seemed evident that coding for ‘missing’ information would confound issues of decision making as it related to clearance.

In other words detectives are prone to put what they find relevant into their case files, but that there are only a few standard documents that could be relied upon to provide an indication as to what is not relevant to the investigation. Therefore, it was decided that if a variable was not discussed in the case file somewhere, it would suffice that this was not a variable of concern within the investigation. In other words, the information provided in the files was coded for indications as to what the detective believed he/she had at his/her disposal when investigating the crime, not any objective determination of what really happened. For example, the HAC-M provides for indications of the presence of drugs and/or drug paraphernalia at the crime scene. The present study is concerned with how DNA affects clearance, and clearance is directly tied to how detectives follow evidence. Therefore, whether or not there were actually drugs at the scene is not relevant to the present analysis. Relevancy is found in the fact that the detective(s) considered the presence of drugs and/or drug paraphernalia at the crimes scene in making their investigative decisions.

In that sense this study differs from the previous use of this instrument (Wellford & Cronin, 1999) as this study is not concerned with the true nature of the homicide scene as it was objectively determined after the fact, but subjectively determined from the detectives' point of view as the investigation unfolded.

Dependent Variable

The homicide case's clearance status serves as the dependent variable – the case is either open or cleared by arrest. Cases of exceptional clearance or cases that were determined to be justifiable were excluded from analysis as this study is designed to examine how DNA is affecting investigative decision making, not definitional legal issues. In both exceptional and justifiable cleared cases, the participants are known: the concern with these cases is whether or not the actions committed were legal and/or whether factors exist to support prosecution – the correct identification of the actors involved is not at issue.

Independent Variables

A preliminary examination was conducted using the DNA Case Models themselves as independent variables by examining how clearance is related to each case model. Then the HAC-M (Appendix A) was used in coding the 223 variables, dichotomously (yes or no), to see how they relate to the clearance of a homicide case within each DNA Case Model.

The use of DNA

The original purpose of this study was to determine the size and clearance rate of each DNA Case Model within the population of cases investigated within the Borough of Manhattan. To that end 593 available case files (out of an original cohort of 1037) were individually assigned to one of the four DNA CMDs.

A Chi-Square analysis of clearance within the four DNA Case Models will inform us as to how each Case Model is related to clearance and whether or not the differences in these clearance rates are statistically significant.

Examination of the sample

The present analysis also examines the independent variables provided by the HAC-M in relation to the four DNA Case Models (DNA irrelevant; DNA requested, but not examined; DNA available pre-arrest; and DNA failed to include a tested subject) within the selected 184 cases. Again by utilizing a Chi-Square analysis a simple correlative test will evince how strongly each of these variables is related to clearance via placement within the four study groups.

Hypotheses

The rise of DNA evidence in the last twenty years has been seen as nothing short of phenomenal. The theoretical potential of this new and exciting form of evidence - one that can tie a specific person to a specific scene - has been used with greater and greater frequency in courts of law (see Chapter 1). However, the utility of this new and exciting form of evidence at the investigative level seems to come with a certain level of controversy in both theory and application (Pratt, et al. 2006). Therefore the first hypothesis examined is:

Hypothesis 1) DNA evidence has played a substantial role in clearing homicide cases in Manhattan from 1996 to 2003.

This size and clearance rates of DNA CMD-3 and 4 will be used to examine this hypothesis.

An analysis of the literature on homicide clearance has suggested that cases with more physical evidence would have a higher clearance rate than those with less physical evidence (Puckett & Lundman, 2003). This is also supported by conventional wisdom (Geberth, 1996, Fisher, 2000). Therefore, we would expect DNA Case Models 3 and 4 to have higher clearance rates than DNA Case Models 1 and 2. If not it would be wise to see how many cases were not helped or even negatively (if making an arrest is considered positive) affected by DNA use. Therefore;

Hypothesis 2) The "Corrective Effect" – the combined effect of an increased use in the forensic analysis of DNA evidence failing to link tested subjects to the crime and a change in the investigative environment fostered by the belief in the efficacy of DNA - is related to the drop in homicide clearance.

Since a detailed analysis of physical evidence and clearance is absent from the literature (and Given the results of the analysis of Hypotheses 1 and 2) it would seem prudent to examine whether or not physical evidence (a form of evidence considered objective to the homicide investigator) could be related to lower clearance. In other words, could a shift from subjective forms of evidence used in the past to objective forms of evidence used more and more frequently today be somehow responsible for the drop in homicide clearance? Therefore;

Hypothesis 3) The collection of objective, physical forms of evidence other than DNA within a homicide investigation will be correlated with higher clearance.

As the HAC-M instrument used in this research affords such an exploration (Wellford and Cronin, 1999), it would seem beneficial to examine what variables within this dataset are collectively predictive of clearance, and how predictive they are. A Chi-Square independence test is conducted on each variable in relation to clearance. Further, a backward stepwise logistic regression is performed with all variables found within the sample to have been correlated with clearance (positively or negatively) via a Chi-Square analysis significant at the .05 level or better (and subsequently found to be substantively relevant).

Why Chi-Square?

The use of a Chi-Square test of significance is appropriate for the present analysis given the nature of the hypotheses being examined and the level of measurement of the variables. As Chi-Square examines the null hypothesis (it assumes that there is no relationship between the two variables being examined) it provides an indication of association – nothing more. By examining comparisons between the observed results and the expected results for each cell analyzed it will be apparent if such associations exist. Further, as the data examined here are only capable of showing that certain factors or forms of

evidence are associated to clearance, it would be premature to expect such data to provide any further information related to causality.

Why logistic regression?

Logistic regression has traditionally been viewed as the best way to examine a dichotomous dependent variable in relation to multiple independent variables (Long, 1997; Bachman & Paternoster, 1997). This is due to the fact that by using a dichotomous dependant variable coded as “0 for No” and “1 for Yes”, as is the case here, the probability of that variable occurring is the result. “The observed (and expected) values of the dependant variable are bounded between 0 and 1, because we cannot have a probability that is less that 0 or greater than 1” (Bachman & Paternoster, 1997, pg. 567). As such, we can see what the probability of clearance occurring is based on the presence of the variables from the resulting regression analysis. In short, we can see what variables predict clearance and compare the predictive power of each.

Also, the variables examined with this logistic regression were filtered before the regression analysis to be substantially independent of one another (homoscedasticity), therefore the error for each value is normally distributed (Bachman & Paternoster, 1997).

Summary

Homicides committed within NYPD Manhattan Borough precincts should provide considerable insight into homicides committed in America’s metropolitan

areas today. The use of data compiled from the years 1996 through 2003 will provide insight into the inception and continued use of DNA evidence by the NYPD. The dependent and independent variables have been operationalized in such a way that the use of cross-tabulations will evince correlations between clearance and the use of DNA, and other evidence in informing the specific hypotheses examined. Further, the use of logistic regression will evince how successful certain variables are in predicting homicide clearance.

In all, the present analysis should provide a comprehensive overview of how useful DNA is, and how complimentary it can be to the value of many other variables in clearing homicide cases.

Chapter 4: The Utility of DNA Analyses

This chapter examines the 593 available homicide case files in relation to the potential and actual use of DNA analysis. The potential use of DNA evidence is distinct from its actual use in that the presence of evidence likely to yield DNA evidence available at crime scenes can inform us as to any potential the increased use of DNA may have. In other words, in how many homicide cases can DNA possibly assist in making an arrest? The actual availability of a properly constructed forensic analysis of DNA collected from a crime scene, available to compare to a known suspect or DNA database, will inform a different potential, one of practicality in reaching probable cause to make an arrest. In other words, in those cases which were provided a properly constructed DNA analysis, how many end in arrest and was the DNA part of the reason they were cleared?

Clearance Rates

From Figure 1 we can see that the overall clearance rate for the Unavailable cases (59.6%) is very similar to the overall clearance rate for the Available cases (61.6%). This finding prima face suggests that there is nothing significantly different between the unavailable and the available cases regarding clearance. Again, these case files were unavailable for myriad reasons: the case file was with the prosecutor's office as the case was in or near trial, the file was in

transit between various departments, or the file was needed in conjunction with other on-going investigations.

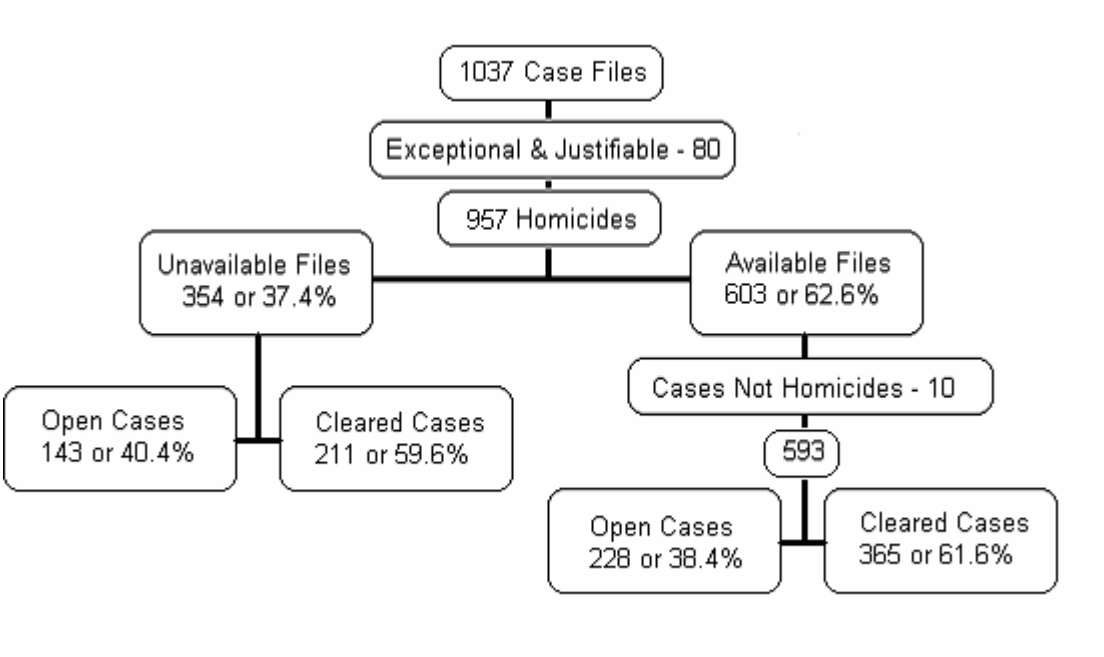


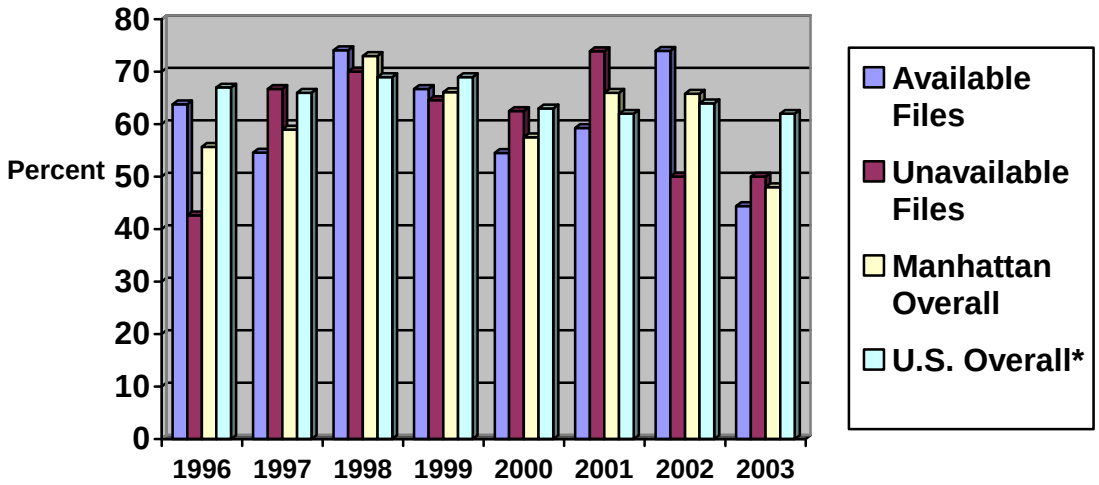
Figure 1: Cohort of Homicide Case Files, Manhattan, 1996 - 2003

Clearance Rates by Year

Graph 1 displays the clearance rates for the available and the unavailable files, as well as Manhattan overall and the U.S. overall, per year. Although the unavailable files were not reviewed their clearance status and year of commission were available from the original data obtained from the Homicide Analysis Unit of the NYPD. The clearance trend experienced by Manhattan over the time period examined is more sporadic than the nation as a whole. Manhattan's clearance rate reaches a high of 73% in 1998 and a low of 48% in 2003. The nation as a whole has a much smaller fluctuation – from a high of 69% in 1998 and a low of 62% in 2003. The fluctuations in the clearance rates of

the available and unavailable files are greater than the fluctuations in clearance for Manhattan or the nation as a whole. Unavailable files have a high of 73.9% in 2001 and a low of 42.6% in 1996, a span of more than 30%. The available files have a near identical span with a high of 74.1% in 1998 and a low of 44.4% in 2003. From this it seems clear that Manhattan's overall clearance rate seems to more closely resemble the clearance rates of the available files than it does the U.S. overall. This is to be expected as the overall clearance rate for Manhattan is an average of the clearance rates of the available and unavailable files. However, these differences could also speak to possible problems with the generalizability of the conducted study's findings to other cities in the U.S. – although the clearance rate of the files analyzed here (the available files) is representative of Manhattan as a whole, Manhattan may not be representative in clearance of the nation or any specific city within it.

Graph 1: Clearance rates per year



*Source – Bureau of Justice Statistics Homicide Trends in the United States, http://www.ojp.usdoj.gov/bjs/homicide/tables/clearedtab.htm

A second methodological issue may also be a factor in the present analysis as there remains the possibility that the homicides within the unavailable files could be substantially different in some way from the homicides documented in the available files. Such a difference could bias the data analyzed here to favor variables found in the available files which may be absent in the unavailable files (or vice versa). In other words, the possibility still exists for the available files to not be representative of the population of homicides in Manhattan during the study period. One way to address a certain degree of this possible bias is to compare the clearance rates for the unavailable to the available files.

Although the overall clearance rates for the available and unavailable files are not dissimilar (Figure 1), the differences in year to year clearance rates do fluctuate somewhat – the largest gap between the two groups being in 2002. In that year the Available files had a clearance rate of 74% and the Unavailable files had a clearance rate of 50%; a 24% difference. The smallest gap in clearance occurs in the year 1999 – in that year the Available case files had a clearance rate of 66.7% and the Unavailable has a clearance rate of 64.6%. In four years (1996, 1998, 1999, and 2002) the clearance rate for the Available files was greater and in four years (1997, 2000, 2001, and 2003) the clearance rate for the Unavailable files was greater. The average difference in clearance rates between Available and Unavailable overall was 11.5%.

How these differences in clearance may have affected the present analysis is unknown, but certain possibilities do exist. If, for instance, within the

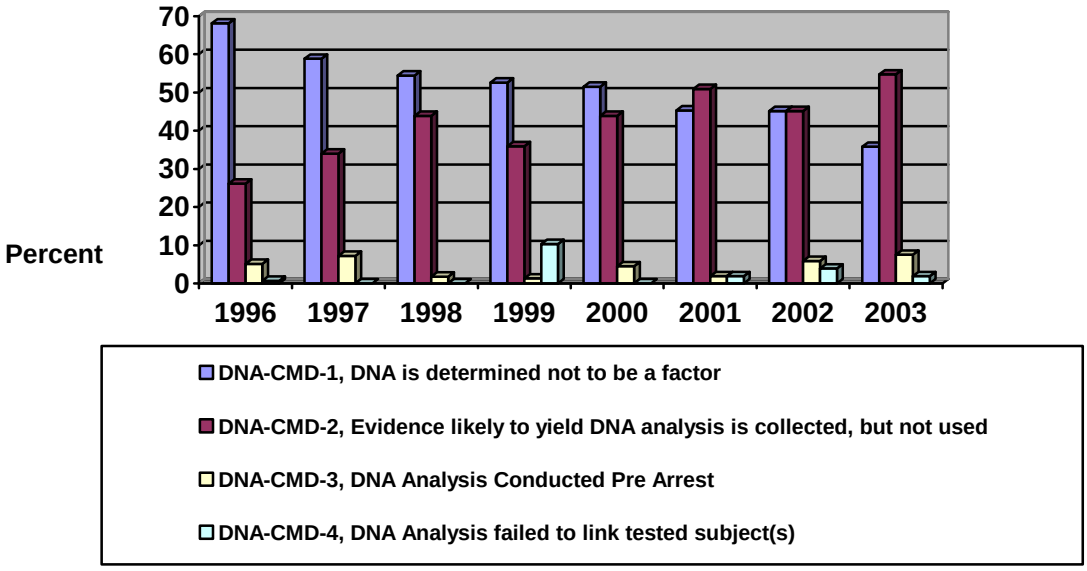
year 2002 a significant number of the Unavailable files were to contain elements that are absent from the Available case files (elements related to clearance) then the results of the present analysis for that year may be biased and could skew the rest of the data. As there was no information discovered during the course of this research to indicate that homicides could have fluctuated so severely from any one year to another in relation to clearance and given the overall similarities in clearance of the Available and Unavailable case files (indeed the similarities of all three groups - Available, Unavailable, and Manhattan Overall), it would seem likely that these differences in clearance taken in totality would have a minimal effect on the analyses conducted.

The Available Files

Each of the 593 available files was examined for the presence of a DNA analysis. As such these files can all be allocated to one of the four DNA-CMDs; DNA-CMD-1, DNA is determined not to be a factor in the investigation; DNA-CMD-2, Evidence likely to yield a DNA analysis is collected, but no examination is conducted; DNA-CMD-3, a DNA analysis exists pre-arrest, and; DNA-CMD-4, a DNA analysis failed to link at least one tested subject to an element from a crime scene. The prevalence of each DNA-CMD for each year (1996-2003) and the clearance rates for each DNA-CMD are compared to examine the overall utility of DNA evidence within homicide investigations. By examining the percentage of cases in which evidence likely to yield a DNA analysis is collected from the scene (DNA-CMD-2) in conjunction with those cases in which DNA was

determined not to be a factor (DNA-CMD-1) we can also get a clear picture of how often DNA analysis can potentially be used in homicide investigations.

Graph 2: Percentage of DNA Case Models per year



Prevalence of DNA

Graph 2 indicates that in 1996, evidence likely to produce a DNA analysis was not collected (and therefore presumably not perceived to be a factor in the investigation) in over 65 percent of the homicide cases. This percentage drops consistently each year and by 2003 has dropped to around 35 percent. As expected this decrease in DNA CMD-1 is matched by an increase in DNA CMD-2: by 2003 more than half the cases involved the collecting of evidence likely to yield a DNA analysis. This indicates that there has been, among this police department, an increased *interest* in the use of DNA evidence in solving homicide cases. However, as DNA-CMD-3 and -4 indicate, this interest is not

met with a corresponding increase in use. Quite surprisingly DNA analyses available pre-arrest were found in only 40 cases (DNA CM-3 and 4 combined). As such, of the original 593 cases, only 6.7% could be affected by a DNA analysis pre-arrest. Therefore, DNA alone cannot have had a substantial effect on homicide clearance within the Borough of Manhattan, nor could it have solely produced a corrective effect.

This total number of DNA cases (forty) is far more surprising than it is telling. A great deal of, what can only be called opinion or speculation, has emerged in the literature regarding the use and function of DNA in the criminal justice process. Almost all the existing literature focuses on the "CSI Effect[11]" and has been suggested by both prosecutors and defense attorneys as having an effect on how jurors decide the issue of guilt in criminal trials. However, there exists no literature on how this phenomenon could be effecting police investigations and only one study which scrutinizes the CSI Effect, via an empirical experiment, regarding jury decisions in criminal trials. Podlas (2006) presents;

> … a study of 254 jury eligible adults who responded to surveys of television and *CSI* viewing habits as well as to a criminal law scenario measuring the potential impact of *CSI* viewing. The results show that, despite numerous media stories and law enforcement warnings of a "CSI Effect" crippling our criminal justice system, no such effect exists – at least not any effect that harms, rather that helps, the prosecution (Podlas, 2006, p 432).

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[11] "The "**CSI Effect**" (sometimes referred to as the "**CSI syndrome**") is a reference to the phenomenon of popular television shows such as the *CSI franchise*, *Law & Order franchise*, and *Crossing Jordan* raising crime victims' and jury members' real-world expectations of forensic science, especially crime scene investigation and DNA testing. This is said to have changed the way many trials are presented today …" (http://en.wikipedia.org/wiki/CSI_Effect).

Podlas' (2006) conclusions highlight an inconsistency regarding what the perception of forensic evidence is by the population at large and the realities of the uses of those forms of evidence. The present study's first significant finding, that only 6.7% of homicide cases used a DNA analysis pre-arrest, is in agreement with this noted inconsistency. One examination of the "CSI Effect" (Maricopa County Attorney's Office, 2005) found that nine of the top 20 rated shows in America today are forensic crime television dramas. It therefore seems possible that the influence these forensic crime dramas are having on the public has created at least one misconception among one agency within the criminal justice system (the prosecution) regarding the effect of forensic evidence. As the present analysis seeks to evaluate how DNA is used by homicide investigators, the next logical area of examination would be whether or not homicide investigators could be affected in a way similar to prosecutors – a way that changes how homicides are being investigated.

The results of Podlas' study notwithstanding, it would be disingenuous to apply the opinions of "jury eligible adults" to those trained to, and possessing a great deal of experience in, investigating homicides. Therefore, how the beliefs regarding the uses of forensic evidence held by society at large have affected the homicide investigation remains unknown (but, it remains an excellent area of future research). However, it would be logical to deduce that if prosecutors believe that juries will not convict without forensic evidence that the direct link between investigations and prosecutions would call for an increased use of

forensic sciences like DNA at crime scenes. Again, the present data support the NYPD's interest in collecting this evidence (the increase over time in DNA-CMD-2, and the matching decrease in DNA-CMD-1), but the paltry 6.7% of cases which have available to them a properly constructed DNA analysis would indicate that such prosecutorial needs, if in fact they do exist, are not being met with corresponding investigative action pre-arrest.

Clearance Rates of DNA-CMDs

The over all clearance rates of each DNA-CMD can be seen in Figure 2; a year by year breakdown is visible in Graph 3.

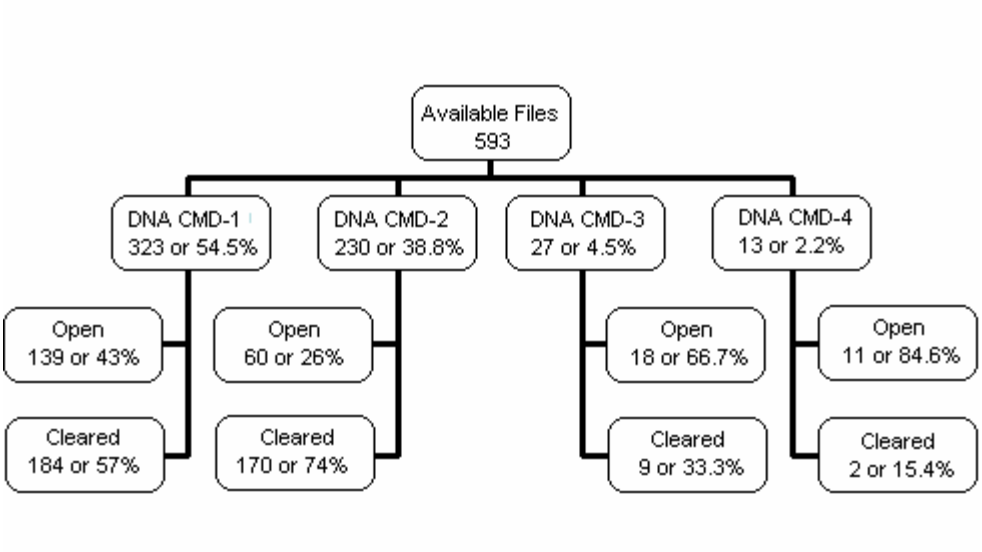
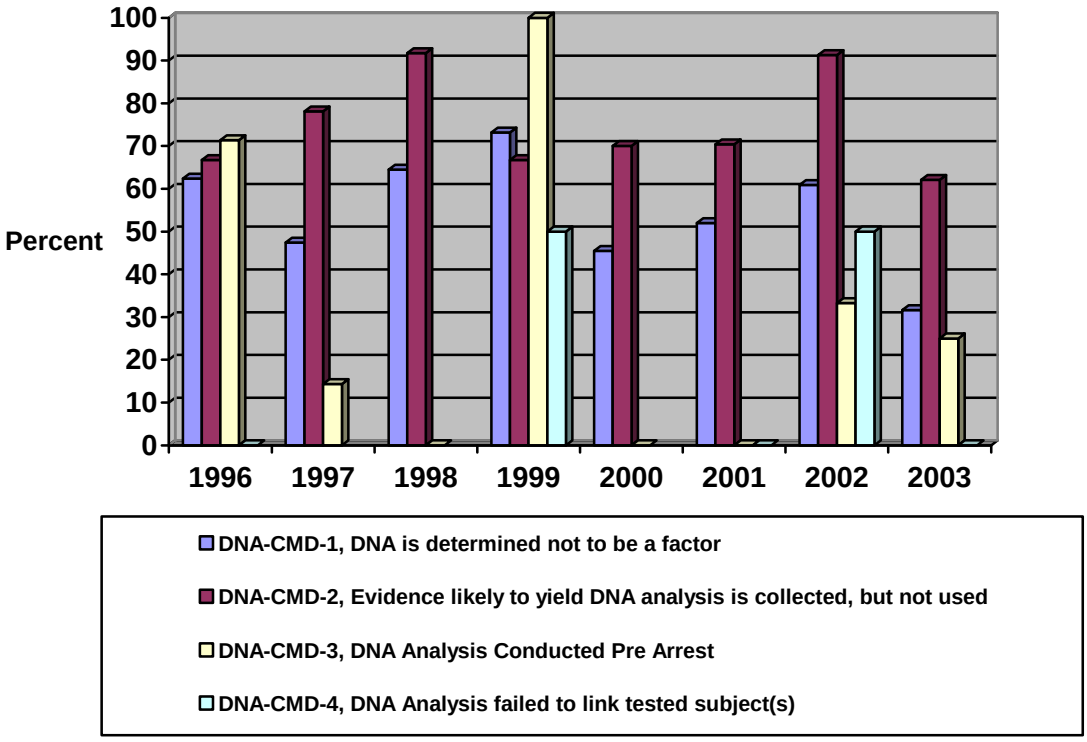


Figure 2: DNA Case Model Designations and Clearance

(DNA CM-1: DNA not relevant to the investigation; DNA CM-2: DNA was requested, but not used; DNA CM-3: DNA analysis available pre-arrest; DNA CM-4: DNA analysis failed to implicate a tested subject)

Graph 3: Clearance rates of DNA Case Models per year



Overall the highest clearance rates are found in DNA-CMD-2; the lowest clearance rate found within DNA-CMD-2 is in 2003 and is above 60%. DNA-CMD-1 possesses a lower overall clearance rate but does exceed DNA-CMD-2 in the year 1999. The DNA cases (DNA-CMD-3, and -4) have wildly fluctuating clearance rates (27.5% overall) most likely due to the infrequent, and sporadic, appearance of DNA analyses throughout the time period examined. The reasons for the rarity of DNA analyses in homicide cases will be discussed later in the chapter.

At first glance the above graph seems to indicate that DNA has been somewhat useful in certain years; most visibly in 1996, 1999, and 2002.

However, in 1996 there were only 8 DNA cases (7 from DNA-CMD-3, and 1 from DNA-CMD-4), in 1999 there were 9 cases (1 from DNA-CMD-3, and 8 from DNA-CMD-4), and in 2002 there were only 5 cases (3 from DNA-CMD-3, and 2 from DNA-CMD-4). As such the clearance rates from DNA-CMD-3 and -4 do not provide any real information regarding the effectiveness of DNA evidence in producing clearances in comparison to the much larger number of cases found in DNA-CM-1 and -2.

Implications for Homicide Clearance and the "Corrective Effect"

Graph 2 assists in addressing the first of the research questions discussed in Chapter 1, and the first Hypothesis posed in Chapter 2; how often is DNA being used?; and has DNA had a significant effect on the homicide clearance rate?. The respective answers appear to be: DNA is used infrequently, and as a result, it has had little impact on homicide clearance. Moreover, by adding the total number of cases from DNA-CMD-2, -3, and -4 we can get an idea of how many cases have the potential of receiving a DNA analysis. From Graph 2 it is apparent that 270 cases (DNA-CMD-2, -3, and -4 combined) out of a total 593 (or 45.5%) have the potential for the creation and use of a DNA analysis as part of the investigation. Out of the 270 cases that have the potential to use a DNA analysis only 40 did. This means that analyses of DNA evidence taken from homicide crime scenes are only being used in 14.8% of the cases in which they could possibly be used. It would therefore seem that homicide investigators are seeking the objective/scientific certainty provided by DNA evidence in a very modest number of cases before making an arrest.

However, to properly analyze this 14.8% in context we must first ascertain in how many cases is the certainty provided by DNA really necessary in effecting an arrest? Simon (1991) proposes that there are two types of homicide investigations: "whodunits", in which a suspect is not readily available at the scene and "dunkers" in which "the detective steps over the body to meet the unrepentant … [killer], who has not bothered to change his bloodied clothes …" (pg. 39-40). Simon's colorful example notwithstanding, it would be disingenuous to expect DNA to play a role in cases which Simon (1991) would describe as "dunkers". Therefore it would seem logical to examine the use of DNA in only those cases that could be described as "whodunits".

Although accepted definitions of "whodunits" or "dunkers" have not been vetted by the existing literature it would seem cogent to use as a proxy-measure the time lapsed between the reporting of the crime and clearing of the case as a rough indication. As such the original data provided by the NYPD Homicide Analysis Unit was examined regarding the date of offense and the date of any recorded clearance for the cohort of homicide cases in Manhattan from 1996 through 2003 (Figure 1 - 947 cases total). If these two dates were found to be within 2 days of each other the case was classified as a 'dunker'. Any case not cleared within 2 days was classified as a 'whodunit.' Of the original 947 cases[12] 226, or 23.8%, are 'dunkers'. By removing the "dunkers" from the above analysis we come up with a slightly different percentage of cases which have a DNA

[12] It should be noted that 5 of the 947 cases did not have clear dates stated for the commission of the offence or the date of clearance.

analysis available pre-arrest – the numerator remains the same, 40, but the denominator changes from 593 to 430.

Forty DNA cases out of a total of 430 available ‘whodunits’ (716 whodunits total, 286 of which were unavailable files) works out to 9.3%. In other words, once we remove all the influence caused by cases that are immediately cleared (the ‘dunkers’) the percentage of cases which have a DNA analysis available to them pre-arrest only changes from 6.7% to 9.3%.

Moreover, when we combine the total number of ‘whodunit’ cases from DNA-CMD-2 (136) to the original 40 DNA cases we come up with a total of 176 cases that could feasibly be affected by a DNA analysis. Therefore, when the ‘dunkers’ are removed from the analysis the above stated 14.8% of DNA-CMDs -2, -3, and -4 increases to 22.7%. In other words, in only about one quarter of the cases in which DNA could feasibly be used (feasibility being determined by both the existence of a DNA sample at the scene and the lack of an immediate solution [whodunit]), it is being used. It would seem that even when testing the utility of DNA evidence within the context of Simon’s (1991) dichotomy (dunkers and whodunits), DNA is still not used very often and therefore cannot be having any significant effect on homicide clearances. Therefore, in addressing Hypothesis #1, it would seem evident that the use of DNA analysis is not having a significant effect on homicide clearance. However, the potential for increasing the use of DNA analyses definitely exists.

From the available data (only 40 DNA cases) the exact nature of ‘How DNA is related to Homicide Clearance’ (research question 2 – Chapter 1) cannot

be discerned. However, several possible and somewhat logical connections between the use of DNA analysis and homicide clearance are apparent and are discussed below.

Time as a factor

With DNA the most salient variable in deference to a homicide investigation is the time involved in processing the evidence in question. However there exists only one study which analyzed time as a variable in relation to other clearance factors. Lee (2005) conducted a piecewise exponential regression with time scaled into months and several factors previous researchers (Black 1976; Litwin 2004) felt were related to homicide clearance. Lee found that there were disparities in the time to clearance when certain ethnic or racial, gender, and age factors were examined. Unfortunately, Lee did not conduct any analysis regarding the use of forensic evidence. However Lee did discover;

> Some of the variables important in predicting the likelihood of clearance in the analysis above were not significant in determining the time to clearance. Variables such as gang killing or the contemporaneous commission of a robbery were less helpful in explaining the time to clearance. These variables were statistically insignificant and including them in the model did not improve the fit … (Lee, 2005, pg. 533)

Lee (2005) seems to be indicating something contrary to the previously held belief that gang killings or killings concomitant to another felony (robbery) take longer (and therefore are harder) to clear (Roegoczi, et al., 2000; Riedel and Rinehart, 1996).

Whatever the case regarding other elements of homicide clearance, forensic evidence takes time to process. Given the realities of processing evidence from crime scenes (i.e. pulling fingerprints from surfaces and/or collecting specimen samples from weapons and clothing) and comparing it to suspects (i.e. entering data to be searched electronically, or taking blood from suspects and comparing it to evidence found at crime scenes) most forensic evidence is not readily available to homicide investigators within a timeframe which would allow it to be helpful in generating an initial investigative tack (Geberth, 1996; Fisher, 2000).

The shortest turn around time for the scientific analysis of DNA evidence in any of the forty DNA cases examined was several weeks – the longest was several years. Clearly the establishment of an investigative tack, if not the resolution of most homicide cases which are cleared (for example 69.44% of the cases examined in the present study were cleared within one month), would have taken place within the first several weeks of an investigation. It could be for this reason alone that so few cases (only 40 out of 593) actually used a DNA analysis within the investigation. Further, because of the delay and expense[13] in analyzing DNA evidence, detectives may only be turning to DNA evidence after all other forms of evidence and investigative techniques have been exhausted. Therefore, the very few cases which have been afforded a DNA analysis pre-arrest (40) may simply be the result of perceived necessity on behalf of those investigating the homicide (i.e. investigators only turn to DNA after everything

[13] Conversations with the Forensic Investigations Division and the Central Investigation & Resource Division of the NYPD have indicated that in 1996 a single DNA analysis cost in excess of $1,000 dollars. By 2007 that cost has been projected to drop to approximately $300 or less.

else has failed). However, it should be noted that this necessity is based on the ability to produce an arrest, not the scientific or objective accuracy of that arrest. This can be seen in the present analysis in that twice as many cases in 2003 had evidence likely to yield DNA (DNA-CMD-2) taken from crime scenes than were found in 1996, and this Case Model Designation has the highest overall clearance rate. From this it could be that within the Borough of Manhattan investigators are doing a better job today of covering all the forensic bases at the scene, but by the time the evidence has been analyzed an arrest has already taken place. As such it would behoove those who have already secured an arrest through more traditional means (i.e. confessions or eye-witness testimony), not to mention fiscally expedient, to stop the analytic process for that case, allowing those resources (both manpower and scientific analysis) to be used for other cases which have not been cleared.

Expedience vs. Accuracy

The true cost of a trade off of accuracy for expediency, in both money and miscarriages of justice is unknown. However, the literature on homicide investigation makes clear the desire for homicide detectives to rely on the efficacy of forensic evidence in general, and DNA in particular, in solving homicide cases.

> Today, forensic DNA typing is having a significant impact on violent criminal investigations and has revolutionized the ability to identify criminals through national DNA offender data bases (Fisher, 2000, pg. 217).

> The astute homicide investigator will use these new advances in scientific law enforcement [DNA] to eliminate or include suspects during the investigation and add to the body of evidence for a subsequent trial (Geberth, 1996, pg. 539).

However, Pratt, et al, (2006) (discussed in Chapter 2) found that there are currently approximately 96,000 open homicide cases in the U.S. awaiting the results of a DNA analysis. These two opposing forces, the desire to clear homicides accurately and the backlog created by the time and expense of DNA testing, create a rather unique challenge for those investigating homicides today. This challenge is best summed up by the question 'how certain do we need to be before we can make an arrest in a homicide case?' This challenge is, of course, not only experienced in homicide investigations. Many different types of crimes can utilize DNA evidence (Pratt, et al, 2006, state that there are 446,723 other cases awaiting results of a DNA analysis). However, given the nature of some of these other crimes, the evidence created by the DNA analysis may be much more incriminating. Take for instance the case of a burglary, or a stranger-to-stranger rape. The presence of the suspects DNA in almost any capacity would be incriminating and suggest guilt. However, in most homicide investigations the relational distance between victim and any potential offender may negate the power this form of evidence has with other crimes, like burglary or any stranger-to-stranger offense.

The above quotes, taken from seminal texts on the subject of forensic investigation techniques, indicate two assumptions regarding DNA analysis. First, DNA matches between crime scene evidence and known individuals are

having a significant effect on violent criminal investigations – something the current research belies. Second, to be a good homicide detective you need to utilize scientific analyses like DNA as often as possible. These statements are believed to be true not only because of the accuracy of DNA in making identifications but also in DNA's ability to make identifications from very small amounts of physical evidence (Geberth, 1996; Fisher 2000). These two elements working together may have created a misguided perception in the literature regarding the use of DNA: that DNA is *better* at clearing homicide cases than other forms of evidence. DNA is certainly more accurate than some other forms of evidence (like eye-witness statements or confessions) but that does not necessarily mean that it is *better* at creating clearances[14], especially given the time required to process DNA.

Probable cause is the standard of proof required to make an arrest. A brief review of four separate introductory criminal justice texts (Siegel and Senna, 2004: Schmalleger, 2005; Inciardi, 2007; Bohm and Haley, 2007) indicates that probable cause is a "set of facts", "circumstances" or "evidence sufficient" to lead a "reasonably intelligent and prudent person to believe", "a cautious man in believing" or "a reasonable person [to] believe" that "a particular other person has committed a specific crime", "an offense was committed and that the accused committed that offense", "the accused is guilty", or "more likely than not, the proposed action is justified". Belief, reasonableness, and likeliness are a far cry from the certainty of fact proposed by DNA evidence. In other words, the belief

[14] This belief may not be shared by the investigators of the NYPD, which may be the reason only forty cases involved a DNA analysis.

of a reasonable detective that a specific person is responsible for a crime would not stand over the certainty posed by DNA evidence if such evidence was collected and analyzed.

As such, the present analysis could be identifying a refinement to the efficacy of DNA. It could be that DNA analysis will not help foster a significant increase in homicide clearance, but instead will stop the police from making a certain number of arrests. This is both a disturbing and encouraging idea given the number of cases in DMA-CMD-2, cases in which evidence likely to yield DNA has been collected but not examined – disturbing because it possibly indicates that a greater number of arrests would not have taken place had the DNA analysis been conducted, and encouraging in that it seems when DNA is used it is much harder for the police to make a wrongful arrest.

Clearly we want our detectives to use physical evidence in generating probable cause as much as possible – it makes for more accurate arrests. Further, homicide detectives are only given one avenue of evaluation by their superiors, their clearance rate (Chapter 3). In other words, detectives are highly motivated to make arrests. The number of cases in DNA-CMD-2 and its clearance rate may be indicative of the fact that in a significant number of cases the evidentiary certainty provided by physical evidence has succumbed to the expediency of using other forms of evidence which meet the evidentiary value of *belief*. As such it seems clear that a great deal could be learned about the true success rate (or the “correct” rate) of homicide arrests and the use of DNA

analysis if the evidence likely to yield DNA in all the cases in DNA-CMD-2 could also be analyzed.

Implications for DNA Databases

Today, the building of large databases in which the DNA of past offenders can be easily and inexpensively compared to DNA found at crime scenes is at the forefront of many criminal justice policy initiatives (FirstGov 2006). These initiatives are largely reliant upon the assumption that matching someone's DNA to a crime scene will be the defining measure of the matched suspect's guilt. The efficacy of building large DNA databases as a means of clearing more homicide cases is directly tied to this principle (Geberth, 1996; Fisher, 2000) and can be examined by looking at the number of open cases in which evidence likely to yield DNA was collected, but not analyzed or used in relation to clearance and those cases in which a DNA analysis exists which are still open.

From Figure 2 we can see that 60 out of the 230 cases which asked for a DNA analysis and did not obtain it are open and therefore the possibility exists that the use of a large DNA database could possibly assist in clearing those 60 cases in the future. This 60 plus the 29 cases in which DNA evidence is available/used but no arrest has been made (DNA-CMD-3 and 4) gives a total of 89 cases, out of an original 593 (or 15.0%); in all other cases an arrest was made through other means, DNA was already being used successfully, or DNA was determined not to be a factor. However, out of the 40 DNA cases analyzed, 16 (or 40%) discovered the victim's DNA only (Table 1, below). When we apply this to the above discerned 89 cases the number of resulting cases which can be

affected by the creation of large DNA databases drops to 54. Therefore, if DNA from every human being in America was available for comparison to the DNA found at homicide crime scenes, this data indicates the *maximum* possible increase in cases in which there exists a match between DNA from a crime scene and a known individual is 9.1 percent (54 out of 593). However, given the clearance rates of DNA-CMD-3, and -4, it would seem highly unlikely that all of the cases that have DNA evidence available for analysis would be cleared if such a database did exist. In other words it could very well be that a match between a known individual and a DNA sample taken from a crime scene may be less incriminating that previously believed. Given the nature of the crime of homicide – the prerequisite emotion and proximity between victim and offender – it could be that being able to place certain suspects in proximity to the crime scene may have little or no investigative value. Imagine the case of a homicide believed to have been committed by an intimate partner of the victim. If that victim were killed in the home (bedroom, bathroom, or kitchen) they both shared, the presence of the other's DNA at the scene may be of little or no investigative value as the suspected individual may have deposited that DNA at anytime in the past, not necessarily in conjunction with the homicide.

The table below maps out exactly how each of the 40 DNA analyses were used in their respective cases.

Table 1: The Use of DNA Analyses

	CMD – 3		CMD – 4		Total
How DNA was Used	Open	Cleared	Open	Cleared	
Victim only DNA	8	7	1	0	16
Direct Link	2	2	1	1	6
Database Could Provide Further Lead	6	0	9	1	16
Insufficient DNA For Analysis	2	0	0	0	2
Total	18	9	11	2	40

'Victim only DNA' – All DNA analyzed came back to the victim.
'Direct Link' – DNA analysis provided a link between a known suspect and evidence from a crime scene or victim.
'Data Base Could Provide Further Lead' – Representative of a database of the entire U.S. Population.
'Insufficient DNA for analysis' – A determination made by the OCME in the attempt to analyze submitted evidence.

From Table 1 it is evident that in six out of the 40 cases (or 15% of the time) the DNA analyzed found a match between a tested subject and evidence collected from the crime scene. However, out of these six cases, only three resulted in an arrest. From this it can be clearly seen that a DNA match between a known individual and evidence from a crime scene does not necessarily equate to clearing that homicide. There may be many reasons for a DNA match not translating into an arrest in homicide cases. The above example notwithstanding, another possibility, found in one of the cases analyzed, was that the DNA analysis did not single out any one person. In that case a woman had been killed and the investigation focused on those whom she had recently been

sexually involved with – an excellent investigative tack, given the other available information at the scene. However, when the resulting DNA analysis came back indicating 5 separate male donors, all of which were already under suspicion, the DNA analysis did not serve to assist an arrest – the DNA analysis did not provide the police any new information. In fact there existed a myriad of convoluted issues regarding the uses of the DNA analyses within the 40 cases examined. By way of example, there existed a case in which the DNA taken from the crime scene came back only to the victim, and yet that fact served to prevent an arrest. In that case a subject who had physically fought with the victim earlier in the week, and was heard to have made threats to the victim only hours before that victim's particularly brutal stabbing, was found with blood all over his shirt just minutes after the body was discovered. Those three facts alone may have warranted this subjects arrest had the DNA from the blood on the suspect's shirt not been tested. It turned out that the DNA from the blood on the suspect's shirt was not the victim's or the suspect's – it came from another source altogether. In that case, clearly this subject could have been (and indeed in many conversations with the detectives involved in this research it was suggested that he most likely would have been) arrested for that homicide. This case is a perfect example of the corrective effect – but for the DNA analysis an arrest would have taken place. Therefore, it would be erroneous to believe, even if DNA databases could provide all of the DNA-CMD-2 cases matches between known individuals and evidence from crime scenes, that they would end up being cleared because of it[15].

[15] Accepting the limitations of the tiny numbers analyzed here (6 direct links with only 3 arrests), it could

Investigation vs. Prosecution

The use of a DNA analysis at the prosecution stage of a homicide is very different than its use at the investigative stage. The legal standards of evidence between investigations and trials (probable cause and reasonable doubt respectively) provide for very different needs of interpretation of evidence. A detective needs to establish a *belief* that the subject of interest in the investigation committed the crime in question. This belief need only exist among the detectives and throughout the eventual probable cause hearing (Preliminary Hearing or Grand Jury proceeding depending on the jurisdiction in question). Once the case is taken to trial the standard of 'beyond a reasonable doubt' now must be proved by the prosecution – proved to a jury of the defendant's peers who may have no knowledge what-so-ever regarding the science or the practical uses of DNA evidence. This lack of education among the jury regarding the sciences and practical uses of DNA analysis makes a District Attorney's job of convincing 12 layman of someone's guilt, beyond a reasonable doubt, a very different task than detectives using DNA analysis to convince themselves of the probability of a suspect's guilt.

These are important ethical considerations in weighing the goals of not putting people in prison for things the prosecution cannot prove vs. the need to protect the public. Further research is necessary in understanding how

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be argued that only half of those cases which receive a match will end in arrest. Therefore, it could be that the most realistic expectation for an increase in homicide clearance via the use of DNA, even if DNA from every person in America were available, to be around 4.6%.

prosecutors weigh these sometimes competing goals. But suffice it to say that the advent and use of DNA evidence could be having a much more significant effect at the prosecution level than it has been observed here within the homicide investigation.

As the number of DNA-CMD-2 indicates, DNA analysis is available far more often than it used at the investigative stage and therefore the possibility exists for prosecutors to seek DNA analysis to satisfy the above discussed “CSI Effect.” However, in such situations the prosecution runs the risk of discovering information that could be of benefit to the accused. In other words, to prosecutors, the use of DNA evidence may have become somewhat of a gamble. If the DNA analysis is not run, the CSI effect may lead to an acquittal, but if it is run they may discover evidence that could destroy their case against that defendant. As such it would be of great interest to know in how many cases, where a DNA analysis is possible (DNA-CMD-2), are prosecutors requesting an analysis where the homicide investigators did not.

The possibility also exists for the certainty found in a DNA analysis to assist the prosecution in obtaining a plea bargain in cases where the prosecution feels such a plea is appropriate. The scientific certainty provided by DNA can ‘cut both ways’ in that a charged defendant may realize his case is lost, or potentially lost, when faced with the scientific certainty of a DNA analysis which implicates him. Therefore, in certain cases the prosecution may be able to obtain the defendant’s agreement to a plea without a DNA analysis when one is possible given merely the threat of such certainty. The prosecution favors the

plea as it saves time and money and the defendant favors the plea as he/she knows the sentence after trial could be much worse – a trial at which, the suspect believes a conviction would be almost certain given the perceived power or DNA evidence.

Summary

There is no doubt that the analysis of DNA evidence from crime scenes *can* be a powerful tool in determining the identity of the subjects responsible for that crime. However the current analysis throws some doubt on exactly how useful DNA can be in clearing homicide cases. From the above examination it is clear that the analysis of DNA evidence is not having a significant effect (corrective or otherwise) on homicide clearance within the Borough of Manhattan, New York City. The overall percentage of cases that have a DNA analysis available to them pre-arrest is 6.7%. When we account for the number of cases which have no investigative need for forensic evidence (the dunkers) this percentage rises to 9.3%. Only 14.8% of those cases which collected evidence likely to yield a DNA analysis (DNA-CMD-2) had one available to them pre-arrest and when the dunkers are removed from the total number of DNA-CMD-2 cases that percentage only rises to 22.7%. Further, the creation of larger DNA databases will most likely only modestly raise homicide clearance (9.1%), given the number of DNA analyses which provided no new information and the number of direct links between crime scenes and known suspects which did not end in arrest.

Many possibilities still exist regarding the use of DNA evidence at the investigative stage of a homicide. The number of cases in which a DNA analysis is possible but not used (DNA-CMD-2) and their clearance rate may be indicative of the fact that in a significant number of cases the evidentiary certainty provided by DNA has given way to the expediency of using other forms of evidence which meet the value of *belief*. As the time needed to process DNA evidence may be at a minimum several weeks, detectives may be seeking its use in only those cases where they have no other evidence to go on. Therefore, the present analysis could be pointing out a refinement to the efficacy of using DNA evidence. DNA analysis may not only help in marginally increasing clearance rates, it may also stop the police from making a certain number of arrests (or the prosecution from proceeding to trial) in cases where DNA evidence is analyzed and provides information favorable to the accused (i.e. the Corrective Effect).

The analysis of any potential Corrective Effect discussed in this chapter was left wanting. Clearly within a significant percentage of DNA cases the DNA analysis failed to implicate a tested subject and the case remains open (Table1 - 11 out of 40 or 27.5%). Therefore, it could be said that when a DNA analysis is available pre-arrest, over one quarter of the time the analysis serves in some capacity to prevent what ***could*** have been a wrongful arrest had that DNA analysis not existed. However, given the tiny overall number of DNA cases (6.7%) drawing such a conclusion based solely on DNA evidence would be erroneous.

Either way, it seems clear that before we can understand the significance of DNA evidence to homicide investigation, it must be used much more often. To accomplish this, two things are made apparent by the present analysis. First, the analysis of DNA evidence must be made available to the homicide investigator more quickly than it has in the past. Second, as the cost of DNA analyses continues to drop, those cases in which DNA evidence is available for analysis are provided the benefit of that analysis. Only then can we get some adequate understanding of how DNA evidence has, and can, assist the homicide investigation.

Given that DNA cannot be having a significant effect on homicide clearance alone, the possibility remains that DNA may be interacting with other variables related to clearance. Chapter 5 will examine this possibility via independence tests and a binary logistic regression of many other factors related to clearance and will explore the interactive effects of the presence of a DNA analysis.

Chapter 5: A general analysis of clearance

Chapter 4 detailed an analysis of how one form of forensic physical evidence (DNA) was related to homicide clearance. The analysis of DNA evidence failed to provide any great insight into how this form of objective evidence is related to the drop in homicide clearance. Therefore, it seems logical to proceed to an analysis that can assist in identifying predictive relationships between variables, whether they are objective or subjective, and homicide clearance. The following chapter will provide an examination of how all of the examined variables relate to each other in explaining homicide clearance, using chi-square independence tests and binary logistic regression.

As the initial intention of the current research was to examine differences between cases which used DNA evidence in facilitating an arrest and those that did not, a random sample of cases from DNA-CMD-1 and -2 (possessing equal numbers of open and closed cases) were characterized using the HAC-M – a modified version of an instrument used in previous research (Wellford and Cronin, 1999) to examine factors related to homicide clearance (n=184). As so few DNA cases (forty) were discovered, a comparison of variables found in DNA cases to variables found in non-DNA cases (DNA-CMD-1), and cases in which a DNA analysis is possible, but was not conducted (DNA-CMD-2) would be less informative than using other forms of analysis. Fortunately, the selected184 cases (72 randomly selected from DNA-CMD-1, and -2 plus the 40 DNA cases) can serve as a random selection of homicide cases possessing an over-representation of DNA cases. In other words, by using the sample of cases

displayed in Figure 3, we can expect to see variables related to DNA and homicide clearance more clearly as there exists many more DNA cases in this sample (21.7%) than would be expected in any random selection of homicide cases (6.7% overall).

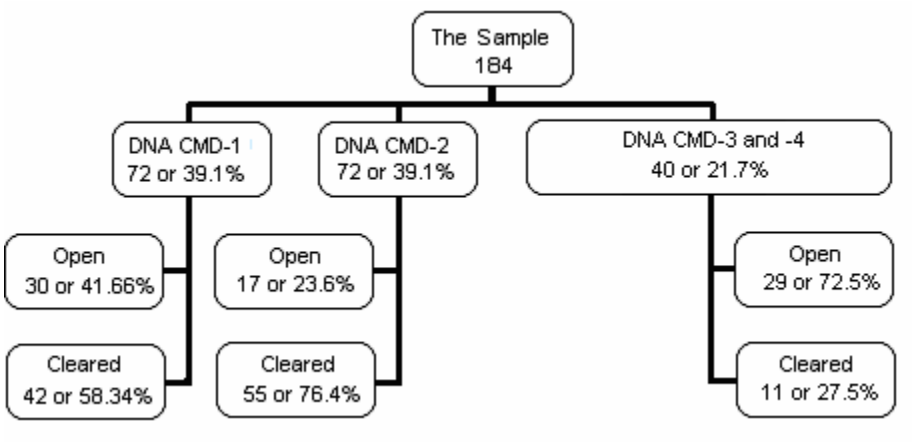

Figure 3: The Sample of Homicide Cases

(DNA CM-1: DNA not relevant to the investigation; DNA CM-2: DNA was requested, but not used; DNA CM-3: DNA analysis available pre-arrest; DNA CM-4: DNA analysis failed to implicate a tested subject)

Clearance and Other Forms of Evidence

Eighteen variables were found to be correlated with clearance (chi-square independence test) at the .05 level of significance or greater after all the variables had been substantively filtered for duplication (many variables in the HAC-M overlap), motive and offender information (Table 2 – below). Motive and offender information is determined by whether or not the variable in question requires understanding something about the motive for the homicide or the offender in determining the presence of that variable. Some previous research has examined the nature of the motives or victim-offender relationships in

discussing homicide clearance (Riedel & Rinehart, 1996; Wellford & Cronin, 1999). However, these variables were excluded from the present analysis in accordance with the idea, presented by Puckett & Lundman (2003), that certain factors which can only be known once an offender has been identified cannot be determined in uncleared cases. Because the present research examines relationships between clearance and other variables, it would be disingenuous to include variables which can not be determined in un-cleared (open) cases. In other words, if a case is not cleared variables related to the motive for the crime, the offender, why the homicide happened, and any relationship between the victim and offender cannot be fully understood.

Chi-Square analysis

From the percentage of cases cleared (and the corresponding chi-square value and significance) we can determine how strongly variables are associated at the bivariate level with clearance. As stated before, objective variables are those in which the validity of the evidence is not questionable by those investigating the homicide, but the relevance of the presented evidence (valid or not) is interpretable by those investigating the homicide. Subjective variables are those in which investigators have a hand in determining both the validity and the relevance of the evidence. For ease in visualization the variables are listed in descending order, based on the percentage of cases cleared, from highest to lowest.

Table 2: Variables significantly associated with clearance*

N= 184 Variables	Cases Cleared	Chi-Square	Sig.	Kruskal's tau
Detective's follow-up on witness info provided a new lead	91.8%	71.260	.000	.000
Witness at scene gave valuable information regarding identification of victim	82.0%	15.380	.000	.000
Computer check on suspect	77.0%	40.432	.000	.000
At Hospital - attending physician/medical personnel interviewed	74.7%	13.320	.000	.000
Decedent went to hospital	72.9%	16.744	.000	.000
Primary cause of death: knife or stabbing/cutting instrument	72.3%	4.848	.028	.028
Witness at crime scene	70.7%	12.753	.000	.000
Witness at scene gave valuable information: any	70.0%	14.417	.000	.000
Witness at scene gave valuable information regarding circumstances of death	66.3%	4.704	.030	.031
Computer check on decedent	54.7%	5.435	.020	.020
Victim's family members interviewed	51.8%	5.955	.015	.015
Victim prior criminal record: any	49.3%	4.213	.040	.041
Detective present at post-mortem exam	41.4%	4.285	.039	.040
Projectiles recovered from decedent	37.5%	7.178	.007	.008
Computer check on witness	36.6%	23.240	.000	.000
Victim history with drug dealers/users	32.0%	8.504	.004	.004
Fingerprints found at crime scene	29.7%	16.028	.000	.000
DNA analysis available pre-arrest	27.5%	20.516	.000	.000

*Via a Chi-Square independence test at greater than a .05 level of significance and filtered for duplication and offender information.

When we examine those variables above which are significantly correlated with greater than fifty percent clearance we can see that certain subjective variables are positively correlated with clearance. Information of various kinds provided by witnesses, the follow-up to that information, an eyewitness being at

the scene, computer checks on the suspect[16], and interviewing members of the victim's family are all variables which provide information that the investigator has to interpret on her/his own in both their veracity and relevance to any given homicide investigation.

However, several objective variables are also associated with higher clearance. The decedent going to the hospital, the interviewing of medical personnel at the hospital, the use of a knife or stabbing/cutting instrument as the primary cause of death or Computer check on decedent are all significantly correlated with higher clearance rates. The decedent going to the hospital and the interviewing of medical personnel will provide the officer with information not open to her/his interpretation. The relevancy of what the medical personnel tells the detective will most certainly be left to the detective, but the veracity of such information is not. Therefore, it could be said that with the exception of the use of a knife or stabbing/cutting instrument as the primary cause of death (in all probability something immediately determinable at the crime scene), the information provided to the detectives by medical personnel at the hospital (also, something that would most likely be transmitted to the detectives very shortly after the murder) and a computer check on the decedent all of the variables found to be related to greater than 50% clearance are subjective in nature – they require the investigator's opinion as to their veracity and their relevance.

[16] 'Computer check on suspect' is determined to be a subjective variable as the 'suspect' is determined by the homicide investigator. 'Computer check on decedent', and 'Computer check on witness' are determined to be objective as the investigator does not have the ability to determine who the victim or witnesses are in a homicide case.

Upon further examination of Table 2 we can see that certain objective variables are associated with lower clearance rates. The victim's prior criminal record (any), Detective present at the postmortem examination, projectiles recovered from the decedent, computer checks on witnesses, the finding of fingerprints at the crime scene, and the presence of a DNA analysis are all significantly associated with lower clearance. These variables are indicative of objective evidence in that those investigating the homicide would have no ability to question the veracity of the evidence presented by such analyses. When a detective is learning about a victim via a prior criminal record, the relevance of that criminal record to the investigation is open to the investigators interpretation, but the information provided by the record is not [17]. When a detective is present at a postmortem she/he is learning from a medical expert what happened to the body – the detective's opinion would not prevail over the Medical Examiner's regarding the results of the autopsy. When projectiles are pulled from a body, the resulting examination/comparison to other bullets or guns is not subject to interpretation by the investigating officer. The matching of fingerprints or DNA from a crime scene to the fingerprints or DNA of known suspects or catalogued prior offenders is not subject to interpretation by the investigating detective.

However, one subjective variable is also associated with lower clearance. The victim's association with drug dealers/users provides information that the investigator has to interpret regarding both the veracity and relevance to any given homicide investigation.

[17] Detectives infrequently need to examine the veracity of a criminal record in that gang crime, plea bargaining and proper legal representation may all be factors in a prior criminal record being misleading as to the character of that individual.

Chi-Square analysis of the 'Whodunit' cases

As in the preceding chapter, it would seem logical to expect that investigations within those cases which were cleared very quickly, the 'dunkers' to operate differently than in cases described as 'whodunits' (Simon, 1991). Therefore, Table 2 below maps out all the variables found to be associated with clearance at greater than a .05 level of significance via a chi-square independence test, after the 52 'dunker' cases have been removed[18].

[18] Within these 132 whodunit cases are still the 40 DNA cases, which means that DNA cases and the variables inherent therein will be greatly over-represented in this analysis.

Table 3: Variables significantly associated with clearance, whodunits only*

N=132 Variables	Cases Cleared	Chi-Square	Sig.	Kruskal's tau
Detective's follow-up on witness info provided a new lead	85.7%	59.788	.000	.000
Computer check provided valuable information	81.8%	7.624	.006	.006
Computer check conducted on suspect	64.4%	32.243	.000	.000
Witness at scene provided valuable information re: identification of victim	64.0%	5.878	.015	.016
Victim alive at scene (non-communicative)	59.3%	3.938	.047	.048
At Hospital – attending physician medical personnel interviewed	56.8%	5.598	.018	.018
Decedent went to the hospital	55.9%	7.969	.005	.005
Witness at scene provided valuable information	52.2%	5.626	.018	.018
Witness at crime scene	50.7%	4.831	.028	.029
Detective's followed up on witness information	46.4%	4.853	.028	.028
Photographed crime scene	38.7%	3.880	.049	.050
Computer check conducted on witness	29.7%	8.251	.004	.004
Specimens collected from decedent	29.2%	5.428	.020	.020
DNA analysis available pre-arrest	27.5%	5.233	.022	.023
Victim prior record, any	26.5%	8.059	.005	.005
Fingerprints found at scene	25.7%	5.445	.020	.020
Projectiles recovered from decedent	20.0%	6.349	.012	.012
Drug paraphernalia at scene	0.0%	4.632	.031	.032

*Via a Chi-Square independence test at greater than a .05 level of significance and filtered for duplication and offender information.

When we examine those variables above which are significantly correlated with greater than fifty percent clearance we can see that certain subjective variables are positively correlated with clearance. All of the variables related to the presence of a witness and the information provided by that witness, except

one, are associated with greater than 50% clearance, as is the use of a computer check on a suspect. These variables are all subjective in nature in that the validity and relevance of the information provided are interpretable by those investigating the homicide.

The victim being alive at the scene, the decedent going to the hospital, and the interview of the attending physician/medical personnel are all objective variables associated with greater than 50% clearance (and are all very similar with regard to the actions and/or concepts those variables capture). Therefore, it could be said that only subjective variables and those objective variables that are very closely related in time to the act of the homicide are associated with higher clearance.

By way of comparison, the prior criminal record of the victim, photographing the crime scene, the collection of specimens from the decedent, a DNA analysis, the location of fingerprints, and the removal of projectiles from the decedent are all objective variables associated with lower clearance. The detective's follow-up on witness information, a computer check on witnesses[19], and the presence of drug paraphernalia[20] at the scene are all subjective variables which are associated with lower clearance.

As such it seems clear that subjective variables are associated with clearance in a variety of ways, both positive and negative. However, the presence of objective variables, particularly those related to forensic evidence

[19] See footnote 15.
[20] The presence of drug paraphernalia was determined to be subjective as discussions with detectives within the NYPD indicated that many items considered drug paraphernalia also have legitimate uses and therefore the detective must determine whether or not they are indicative of drug usage.

(i.e. Photographs, DNA, Fingerprints, and Projectiles) seem related to lower clearance only, except when closely related in time to the homicide event.

Logistic Regression

A backwards stepwise logistic regression (Wald), using the clearance of the case (yes or no) as the dependent variable, was performed with all variables originally found to have been significantly associated with clearance below the .05 level of significance (Table 2). As five of these variables are interrelated (they relate to the presence of a witness or the use of witness information), one of these witness variables, 'Detective follow-up on witness information provided a new lead,' was chosen to represent all of these witness variables in the regression as it provided the largest effect on clearance. The resulting 14 variables were then re-run with all of the variables coded from the HAC-M (after they had been filtered for duplication, motive, and offender information) to check for interactive effects. The resulting seven variables (Table 4) account for over 78 percent of the variance in homicide clearance and this model retains 89.7 percent correct reclassification.

Table 4: Logistic Regression Predicting Clearance

Predictor Variables	B	S.E.	Wald	Odds-Ratio	P-Value
Specimen collected from decedent[21]	-2.435	.770	10.002	.088	.002
Fingerprints found at crime scene	-2.289	.793	8.337	.101	.004
Detective present at Postmortem examination	-2.042	.939	4.731	.130	.030
Victim prior criminal record, any	-2.119	.645	10.790	.120	.001
Primary cause of death – knife or cutting/stabbing instrument	3.139	.854	13.508	23.089	.000
Computer check on Suspect	3.604	.735	24.020	36.729	.000
Detective's follow-up on witness info provided a new lead	4.192	.749	31.362	66.164	.000

-2 Log Likelihood	87.768
R Square (Negelkerke)	.788
Chi-Square	161.717
DF	7
Significance	.000
N	184

From the above regression it seems clear that, with the exception of the primary cause of death being a knife or stabbing/cutting instrument, all the objective variables are predictive of the case not being cleared. The presence of each variable in the above model was originally coded as either "1", meaning that

[21] This variable is almost identical to the variable 'DNA analysis present pre-arrest' as it is indicative of a blood sample taken from the victim. A DNA analysis is rarely of any value when a specimen of the decedent's blood is not available for comparison/elimination to the DNA found at crime scenes. The variable 'Specimen collected …' appears 42 times in the sample, and as mentioned above 'DNA analysis pre-arrest' appears 40 times in the sample.

variable was present within the case, or "0" meaning the variable was not present within the case (the same coding scheme as the dependent variable, clearance – 1 meaning yes, 0 meaning no). Therefore, by examining the positive or negative value of the partial regression coefficient (the B) the direction of predictability can be established[22]. For instance, the most powerful predictor of the case remaining un-cleared is 'Specimen collected from decedent.' The odds ratio of .088 indicates that for every case where a blood specimen was taken from the decedent there exists a 91.2% (due to the negative B value we establish this in deference to one; 1 - .088 = .91.2) chance that case will not be cleared[23]. The P-value of Table 4 establishes that all of these objective variables are significantly predictive of the case not being cleared on an individual basis – that the predictive ability of these objective variables is not a combined effect.

The presence of a knife or cutting/stabbing instrument, as the primary cause of death, is also significantly predictive, but within this model the presence of this variable is predictive of the case being cleared (positive B value, and an odds-ratio of 23.089). The presence of this objective variable therefore increases the likelihood of clearance 23 times.

Further, when we examine the odds-ratios of the subjective variables in the model, which are also predictive of the case being cleared, we see similar

[22] The partial regression coefficient (the B) measures the logarithmic changes in the model based on the presence of that variable. As this analysis is a Binary Logistic Regression this number is of little or no analytic importance in understanding this variables relationship with clearance. However, the value of that number (positive or negative) is indicative of the direction of the predictive ability of that variable.

[23] The reason the terms "un-cleared" or "not cleared" are used instead of "case remaining open" is that the values used for coding all of the variables in the model (the dependent and the independent) are coded as 0 for no and 1 for yes. Therefore, this model cannot technically tell us about the predictive ability of the case remaining 'open', it can only tell us about the probabilities of reaching the value of 1 – the clearance of the case.

effects; ‘Detective’s follow-up on witness information provided a new lead’ increases, by a factor of 66, the likelihood of clearance; and the odds ratio of ‘Computer check on Suspect’, 36.729, indicates an increase in the likelihood of clearance by a factor of nearly 37. In other words the three strongest predictors of clearance in the model are the use of a knife, running computer checks on suspects, and the detective’s fruitful follow-up to witness information.

What is unfortunate given the nature of a binary logistic regression is the inability to compare the negative predictability provided by objective variables to the positive predictability of subjective variables. The R Square only tells us how all the independent effects of each variable work together in explaining clearance (the current model explains 78.8 percent of the variance in clearance). In other words, even though the odds-ratios of certain subjective variables (Primary cause of death – knife or cutting/stabbing instrument’, ‘Computer check on Suspect’, and ‘Detective’s follow-up …’) increase the likelihood of clearance many times more than the negative effects produced by the presence of other objective variables, this does not mean that the presence of that subjective variable in a homicide investigation will ‘overshadow’ the opposite effect provided by the presence of the other objective variables.

In summary, Table 4 indicates that certain objective variables (DNA, Fingerprints, Detective at post-mortem, and Victim’s prior record) are significantly predictive of a case not being cleared and the subjective variables (Computer check on Suspect and Detective’s follow-up …) are significantly predictive of the case being cleared.

Logistic regression of the whodunit cases

As above, and in the preceding chapter, it would seem logical to expect that a regression analysis of variables within those cases which were cleared very quickly (the ‘dunkers’) to operate differently than in cases described as ‘whodunits.’ Table 5 maps out a backward stepwise logistic regression of all the variables in Table 3 (found within the 132 whodunit cases), after they have been substantively filtered for duplication and conceptual independence. Six variables remain in explaining three-quarters of the variance in homicide clearance and this model retains 90.2 percent correct reclassification.

Table 5: Logistic Regression Predicting Clearance, whodunits only

Predictor Variables	B	S.E.	Wald	Odds-Ratio	P-Value
Detective's follow-up on witness info provided a new lead	3.913	.755	26.860	50.055	.000
Computer check on suspect	2.621	.739	12.578	13.751	.000
Photographed crime scene	-1.696	.804	4.451	.183	.035
Specimens collected from decedent at post-mortem	-2.078	.725	8.217	.125	.004
Victim prior criminal record, any	-1.476	.714	4.278	.229	.039
Projectiles recovered from decedent at post-mortem	-2.246	.967	5.391	.106	.020

-2 Log Likelihood	70.907
R Square (Negelkerke)	.756
Chi-Square	109.042
DF	6
Significance	.000
N	132

As with the regression detailed in Table 4, the variables predictive of clearance are subjective in nature (Detective's follow-up, and Computer check on suspect) and their individual appearances increase the likelihood of clearance many times (50 and 13 times, respectively). The use of a knife or cutting/stabbing instrument as the primary cause of death does not appear in this model and the significance of this will be discussed in comparison to the findings of prior research (the following section).

However, given that this model is only indicative of cases in which some investigation was required (the whodunits) it seems very significant that the two most powerful variables in predicting clearance are the same in both models. In other words, what is predictive of clearance within all cases (the whole sample – Table 4) seems to also be predictive of clearance in cases requiring some investigation (the 'whodunits' – Table 5) when a knife is not used as the primary cause of death. The implications of this finding will be discussed in the following chapter.

The variables predictive of the case not being cleared are, again, objective in nature (Photographs, Specimens collected, Victim's prior record, and Projectiles). 'Photographed crime scene' appears in this model and not in the model presented in Table 4. Therefore, it could be said that the use of crime scene photographs and the analyses of projectiles are only significant in cases requiring some investigation, however the B for these variables have negative values – they are indicative of the case not being cleared. The presence of crime scene photographs is predictive of the case not being cleared (1 - .183) 81.7% of the time and the recovery of projectiles from the decedent is predictive of the case not being cleared 89.4% of the time.

These findings are particularly baffling as intuition would seem to indicate that when an investigation (which takes time to conduct) is needed, the presence of photographs of the scene would aid in reconstruction of the scene, assist in enhancing memory, assist in establishing the need for other forensic analysis, and/or benefit the investigation in many other ways. The ability to compare a

projectile taken from the victim to any located firearm would seem to also be very helpful in determining probable cause to make an arrest. However, this regression indicates that the presence of crime scene photos and the collection of projectiles from a victim could somehow interfere with the process by which probable cause is generated in making an arrest in 'whodunit' cases.

The objective variables 'Specimens collected from decedent …' and 'Victim prior criminal record, any' are found to be predictive of the case not being cleared in both Tables 4 and 5. Therefore, the presence of these variables seems not to be effected by the passage of time within the investigation; their presence within a homicide investigation is predictive of the case not being cleared whether a substantial investigation takes place or not.

Comparisons to prior research

What is most striking from the chi-square analyses and the regressions performed in relation to prior research is the element of time. Although the present analysis is in agreement with Riedel and Rinehart (1996) in gender is not significantly related to clearance, their comments on 'circumstance' and 'further investigation' likely reflect the element of time in an investigation. Riedel and Rinehart (1996), point out that 'further investigation' may be related to higher clearance, whereas the present analysis would indicate certain objective elements of 'further investigation' (i.e., Fingerprints, Specimens, Projectiles) are significantly related to lower clearance. Also, in conjunction with other research

(Chapter 2), the use of firearms does not seem to be significantly associated with clearance either way.

In support of the findings of some past research (Riedel & Rinehart, 1996; Wellford & Cronin, 1999; Regoeczi, et al., 2000; Puckett & Lundman, 2003; and Addington, 2006), a homicide committed with a knife or cutting instrument in the present data is significantly correlated with higher clearance. However, the present analysis seems to be in direct opposition to Pucket and Lundman's (2003) reason for knives being correlated with higher clearance - that "homicide clearances rise or fall on the amount of physical evidence created while committing the murder" (Puckett & Lundman, 2003, pg. 175). In the present study the finding of fingerprints, specimens from the decedent, projectiles and autopsy analyses are all predictive of lower clearance and a knife as a primary cause of death disappears from the regression in the 'whodunit' analysis. As such, the belief that knife homicides have a high clearance because of the resulting physical evidence left behind may be misguided. It would seem more likely that some variable related to the use of a knife or cutting instrument in the commission of a murder other than the creation of physical evidence may be related to higher clearance within cases that require some level of investigation (the 'whodunits'). One possibility for this is that a greater number of witnesses could be involved when such weapons are used as the interaction required to complete the murder may take longer or be more visible and therefore attract more attention. Another possibility may be that knives/cutting instruments are used more often in intimate partner violence and therefore appear more in

'dunker' cases. Whatever the reason clearly more research is needed to properly assess this inconsistency.

Another finding consistent with previous research is the predictive ability of 'Computer checks on the suspect' on clearance. Wellford and Cronin (1999) found that the use of computer checks on suspects (as well as several others within the investigation) is associated with higher rates of clearance.

Summary

Findings here suggest that forms of physical evidence are, for the most part, not associated with high rates of clearance. With the exception of the use of a knife or stabbing/cutting instrument as a primary cause of death, and the detective conversing with the treating physician at the hospital (if the victim made it to the hospital) all other variables which were associated with clearance (chi-square independence test, significant beyond the .05 level of significance) are subjective in nature.

The regression analyses conducted on the whole of the sample (n=184) and just the 'whodunits' (n=132) yield similar results. With the exception of the use of a knife as a primary cause of death in the analysis of the whole sample, only objective variables are predictive of the case not being cleared in both backwards stepwise regression models. However, the objective variables that appear within the two models change from the analysis of the whole sample ('dunkers' included) to the 'whodunits.' 'Fingerprints found at crime scene,' 'Detective present at postmortem,' and 'Primary cause of death – knife or

cutting/stabbing instrument' are removed from the model and 'Photographed crime scene,' and 'Projectiles recovered from decedent at postmortem' emerge when the two models are compared.

The two most powerful variables in predicting clearance are the same for both models (all the cases, and only the 'whodunits'); 'Detective's follow-up on witness info provided a new lead' and 'Computer check on suspect.' These variables immensely increase the likelihood of clearance in both models.

The following Chapter will discuss the implications of these findings in the context of how objective and subjective forms of evidence can be used to increase homicide clearance rates.

Chapter 6: Implications, discussions and conclusions

Homicide clearance rates have dropped considerably in the United States since the early 1960s (BJS, 2002c; FBI-UCR, 2006; Regini, 1997; Wellford and Cronin, 1999). The rise of DNA evidence in the prosecution of crime, homicide or otherwise, is beyond dispute (Chapter1). The present analysis has provided an indication of how DNA is being utilized at the pre-arrest stage of a homicide investigation and how the use of other objective forms of evidence are related to clearance rates.

Conventional wisdom and practice calls for the use of forensic evidence in solving homicide cases (Geberth, 1983; Gilbert 1993; Geberth, 1996; Lyman, 1999; Fisher, 2000; Inman and Rudin, 2001; Gaines & Kappeler, 2005). Thus, the negative association between the use of several forms of forensic analysis and homicide clearance (Chapter 5) seems counter-intuitive. However, this conventional wisdom assumes that the forms of evidence that were used before forensic evidence became available were not as effective at producing clearances as forensic evidence is today.

As the Borough of Manhattan, New York City, is populated by dozens of different cultures, myriad socio-economic-strata and a very transient population it is a suitable source of homicide cases in the study of factors related to homicide clearance. The experience of detectives within this Borough (or City) would be among the most learned in the profession owing to the number of homicides which occur in New York City as well as the NYPD's resources and reputation in law enforcement. Counsel with the NYPD made clear the most fruitful time

period within which to analyze factors related to DNA and clearance (1996 through 2003) and 593 of the 1027 total homicide case files (the cohort) were located. Once the total number of DNA cases was identified, forty total (DNA-CMD-3 and -4 combined), control samples of the other two DNA Case Models were selected (DNA-CMD-1 and -2) and a total of 184 cases were coded using a modified version of the Homicide Attribute Coding Instrument (HAC-M). This instrument (HAC-M) examines 223 variables found to be relevant to clearance in past research on homicide investigations (Wellford & Cronin, 1999).

An examination of frequencies, Chi-square independence tests, and logistic regression analyses were used to evince the relationship between the use of DNA evidence, and objective and/or subjective forms of evidence, and clearance.

Limitations

A possibility emerged regarding the generalizabity of the results when frequencies and clearance rates were compared between the available and unavailable files. There remains no way to be sure that there are not factors present within the unavailable files which could skew the results of the examination of the available files. However, the overall homicide clearance rates of the unavailable files, the available files, Manhattan, and the U.S. as a whole are close enough that concerns about generalizability on these grounds should be tempered.

The most notable limitation in coding the data used in this study was that the HAC-M does not code for confessions. This was decided upon for two reasons. First, a confession is very difficult to code for at the bivariate level (yes or no). Clearly a suspect can make statements that would only partially incriminate him/her in the homicide in question. These statements of partial incrimination could have a very different effect on a homicide investigation than a full confession of guilt. As such it seemed the only way to code for confessions bivariately would be to create several variables representing several different levels of incrimination on the part of the suspect. Second, because of the necessity to accommodate several different levels of incrimination in making confessions a realistic issue in this study, the NYPD felt that it may be possible for individual case characteristics to be identified from the data collected. As the access to the homicide case files granted to this study required that no individual connected with any of the examined homicide cases be identifiable, it was determined that confessions would not be included in the present study.

Also, many prior studies on homicide clearance have commented on motives for the homicide and victim-offender relationships (see Chapter 2). However, this study adopted the reasoning provided by Puckett & Lundman (2003) in deciding not to entertain discussions about variables in un-cleared cases that can only be determined by the clearing of the case. This was done in keeping with the critical nature of this study's hypotheses. By challenging the utility of sciences and practices that are specifically designed to assist in the clearing of homicide cases in a time period characterized by lower clearance

rates, this study relied solely on relationships that can, and are visible given the data available. Therefore, this study avoided borrowing from the 'common-sense' beliefs which have pervaded prior research on homicide clearance (again, see Chapter 2) in the hopes of discovering something previously unseen. Reliance on 'common-sense' beliefs which may be in error can prevent research from uncovering factors which may only be visible by using a more critical approach.

Clearly, examining motives and victim/offender relationships can tell us many things about the nature of the homicides that are cleared. However, given the discussion below regarding the differences between the words 'cleared' and 'solved' as they are currently viewed in our society regarding criminal investigation, it would seem that such analyses may tell us more about how the justice system chooses to see the crime of homicide than it does about who kills whom and why.

Discussion

The present analysis supports six conclusions regarding the use of DNA and other forms of evidence in relation to the drop in homicide clearance.

1 - The use of DNA analysis did not have a significant effect on homicide clearance, one way or another in Manhattan; there are simply not enough cases which have available to them a properly constructed DNA analysis pre-arrest.

2 - The collection of evidence likely to yield a DNA analysis from homicide crime scenes is increasing; a rise in DNA-CMD-2 from 1996 to 2003 has been met with a corresponding decrease in DNA-CMD-1.

3 - Objective forms of physical evidence tend to have associations with lower rates of clearance, and subjective forms of evidence seem to have associations with high rates of clearance.

4 - There is no evidence to support a "Corrective Effect" via the use of DNA analyses; again, so few cases have used a properly constructed DNA analysis pre-arrest that no significant effect can be expected.

5 - When analyzed via a binary logistic regression, most objective forms of physical evidence are significantly predictive of the homicide case remaining un-cleared.

6 - The presence of a witness at a crime scene, and the subsequent investigation of that witness' statements/evidence is the greatest single predictor of homicide clearance.

DNA, the Clearance Rate and the Corrective Effect

The present study's first, and probably most surprising discovery is that a very small percentage of cases actually have available to them a properly constructed DNA analysis pre-arrest (6.7%). Clearly the common social consciousness has placed DNA at the forefront of criminal justice issues. The CSI Effect and the discussions it has fostered have created the perception that DNA is a super-weapon against criminals. Further, detectives are taught to focus

on forensic evidence whenever possible as the objective certainty provided by forensic evidence makes for more competent and efficacious investigations. The fact that this study found only 6.7% of all homicide cases to have made investigative use of a properly constructed DNA analysis pre-arrest certainly belies both the common social consciousness and investigative instruction.

The reasons DNA may not be making it into the homicide investigation pre-arrest are numerous. The time and cost of the analysis make it difficult to use if cases are to be cleared quickly. Therefore, waiting for DNA analyses may serve as a hindrance rather than an aid. From the drop in cases in which evidence likely to yield a DNA analysis is collected (DNA-CMD-1) and the increase in cases in which evidence likely to yield a DNA analysis is collected, but not examined (DNA-CMD-2) it seems clear that the *interest* in the use of DNA analysis is definitely on the increase. This would tend to support the idea that, at least when processing crime scenes, police investigators are very interested in the possibilities presented by DNA analysis. This may be an indication of how homicide investigators are responding to the instructions they receive regarding the certainty provided by a DNA analysis in conducting a proper investigation. If other forms of evidence (usually subjective) have provided for probable cause to make an arrest, expediency would require passing over DNA or other forensic analyses as they are no longer necessary. Moreover, as the investigation moves forward, investigators may be foregoing the certainty provided by DNA by relying on evidence that is more efficient in creating probable cause to make an arrest – evidence that is usually subjective in nature.

This, of course, creates a trade off if the true intention of an investigation is to identify the ‘correct’ offender. By foregoing the accuracy of DNA evidence we may be ‘clearing’ cases, but not necessarily arresting the ‘correct’ person (i.e. the ‘Corrective Effect’ - the more DNA evidence is used the fewer ‘incorrect’ arrests are made and therefore fewer homicides are cleared).

Another way of viewing this is to consider the fact that DNA excludes more from any given investigation than it includes. If, for instance, a detective is investigating a homicide and has four subjects under suspicion, a correct match on a DNA analysis will include/point suspicion at one person, but it will exclude or at least reduce suspicion toward three others. From this simple equation we can see that, in this example, the existence of the DNA evidence excluded three times as many people as it included - a fact that is often overlooked so long as one person *is* implicated. This notion is of particular importance when taking into consideration the 9 cases (22.5% of the total 40 DNA cases) which are still open from DNA-CMD – 4; cases in which DNA failed to link a tested subject. If over twenty percent of the time that we are utilizing DNA, the analysis excludes the tested subject and then fails to implicate anyone else in the suspect pool, it could be logically inferred that DNA has, in a very small way, assisted in ‘correcting’ the clearance rate.

The number of cases in which evidence likely to yield a DNA analysis is collected (DNA-CMD-2) creates the possibility for DNA analyses to be used much more often than they are. The present analysis found that less than 25% of those cases which have collected evidence likely to yield a DNA analysis, and

are not immediately cleared (dunkers), are afforded a DNA analysis pre-arrest. These numbers indicate that there is plenty DNA could be doing to benefit the homicide investigation if technology were to provide for a DNA analysis much more quickly. The shortest turn around time for the scientific analysis of DNA evidence in any of the forty DNA cases examined was several weeks – the longest was several years. Clearly the establishment of an investigative tack, if not the resolution of most homicide cases which are cleared (69.44% of the cases in this dataset which were cleared, were cleared within one month), would have taken place with the first several weeks of an investigation. This may present another reason why so few cases (only 40 out of 593) actually used a DNA analysis within the investigation.

Of course, another option is that DNA evidence, because of the time and expense in analyzing it, may simply be viewed by homicide investigators as a 'weapon of last resort' – they may only turn to DNA analyses after all other investigative avenues have failed, hoping that an eventual match to a subject identified from a growing DNA database will breath new life into their investigation. This rationale assumes that once DNA databases are large enough to link subjects to crime scenes, suspicions will be created, alibis can be dispelled and new leads will emerge which in turn will increase the clearance rate. However, the present analysis indicates that benefit will probably not be experienced in clearance rates rising much more than 5 percent. The number of cases which can possibly be cleared via DNA, and the rates of clearance found within those homicide cases which have a properly constructed DNA analysis

makes it likely that the creation of large DNA databases (indeed, even if DNA from everyone in America were in a DNA database) will not completely address the 27% drop in clearance our nation has experienced over the last 40 years. In all, DNA evidence via its current use seems to have fallen well short of the expectations that have been set for it regarding the investigation of homicide. However, as we have yet to see a wide-spread use of DNA evidence in homicide investigations pre-arrest, the possibility still exists for DNA to assist the homicide investigator in making 'correct' arrests if the DNA analysis could be provided to the investigator much more quickly.

Objective Evidence, Clearance Rates and the Corrective Effect

The chi-square and the regression analyses (Chapter 5) both indicate a connection between the presence/use of certain objective forms of evidence and the failure to clear a homicide case. This creates the possibility that a collective effect of all objective forms of forensic evidence may be decreasing homicide clearance rates.

Clearance, as defined in Chapter 2, is a term used to describe a point in the investigation of a crime where the investigative body has reached, what it considers to be, the resolution of the investigation at hand – a resolution defined by the existence of probable cause to make an arrest. Several other terms have been used to describe this point in the investigative process, but none are as misleading as the term "solved." The Merriam-Webster dictionary defines the word 'solve' as:

> "to find a solution, explanation, or answer for <*solve* a problem> <*solved* the crime>."[24]

The fact that this well known and highly cited dictionary uses 'solved the crime' as an example seems to prove the point - "clearing" and reaching the "solution" seem to have become synonymous in our culture regarding crime. However, the same dictionary defines "solution" as;

> "**1 a :** an action or process of solving a problem **b :** an answer to a problem **:** EXPLANATION; *specifically* **:** a set of values of the variables that satisfies an equation"[25]

Given these definitions it is quite clear that 'clearance' is, in fact, very different from 'solution.' Only by using objective components (e.g. numbers) which are not left open to individual interpretation can an equation ever be satisfied. Therefore, it would seem possible that this lexical inconsistency may be highlighting a more profound effect on the decision making processes within the minds of those investigating crime. If "cleared" has come to mean "solved" it would be very difficult to support the need to reach a level of objective scientific certainty (like that offered by DNA and other forms of forensic evidence) once probable cause has been reached.

How this inconsistency plays out in deference to clearance rates can be explained via the drop in clearance. If in a certain percentage of cases the use of objective forms of evidence is conflicting with more conventional subjective evidence than we can expect the level of probable cause to be reached less and less the more objective evidence is used. If the ultimate goal of any homicide

[24] http://www.m-w.com/dictionary/Solve
[25] http://www.m-w.com/dictionary/solution

investigation is to facilitate a conviction in a court of law, and the increased use of forensic evidence is related to a drop in clearance, than it would seem evident that using the clearance rate as a measure of investigative effectiveness in homicide cases is greatly flawed. In other words, detectives should not be held responsible for what they find when they 'correctly' investigate homicides.

Diagram #1 depicts a model of this concept (this model is also representative of the 9 open cases in which DNA failed to link at least one tested subject).

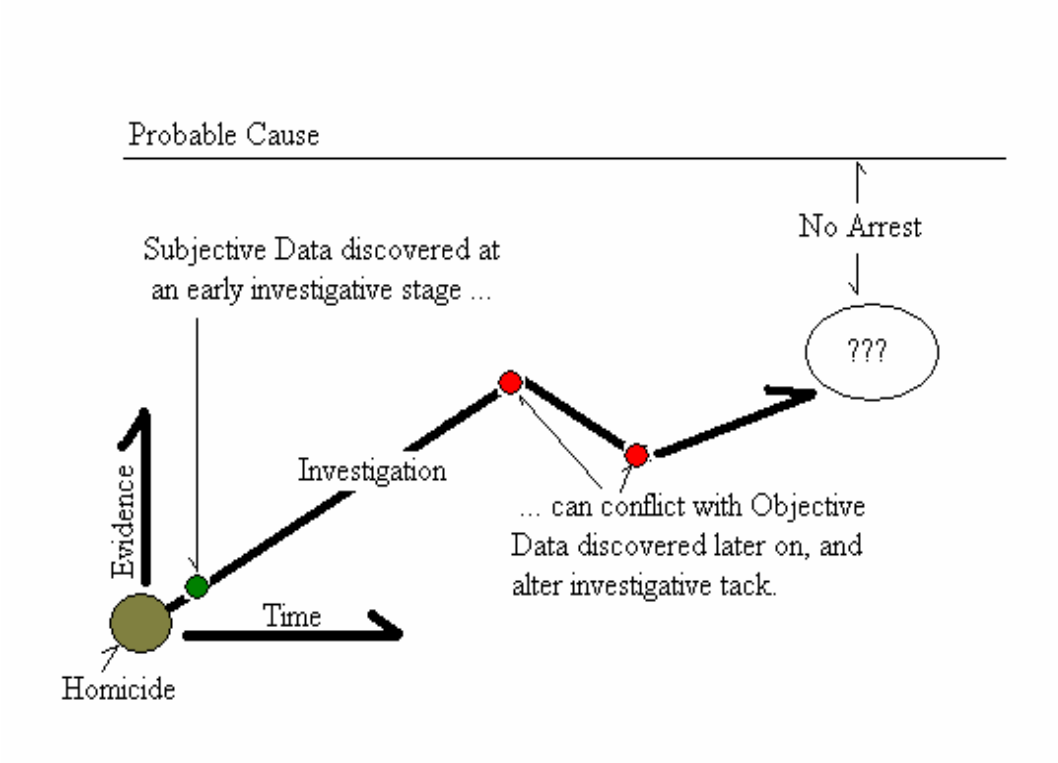

Diagram 1: From subjective evidence to objective evidence

The two axes in this diagram are evidence and time. As time moves forward, evidence is gathered via the investigation with the goal of reaching the line of probable cause to make an arrest. In this diagram we can see that the

subjective data which informed the investigation at or near its inception is countered by objective information which requires time to be discovered – much in the same way DNA failed to link the known, tested suspects in the 9 open, DNA-CMD – 4 cases. The failure of the DNA analysis to 'match' the tested subject can serve as an obstruction to the chosen investigative tack. This, of course, is then exacerbated by the time spent in discovering this obstruction. If the resulting obstruction to the investigative tack and the passage of time combine to prevent the level of evidence from reaching probable cause it could be said that the examination of objective physical evidence 'corrected' a possible 'mistake' in targeting a tested suspect – a mistake that would not have been noticed during a time period in which that objective analysis did not exist. The present analysis does not confirm the existence of this 'Corrective Effect,' however, the 9 open DNA-CMD – 4 cases discussed in Chapter 4, and the predictive value of other objective forms of evidence discussed in Chapter 5 do proffer it as one very real possibility – a possibility whose potential becomes greater with increased use of DNA analysis.

DNA has only been available since 1986, and has only been available to the NYPD as a matter of practice since the early 1990s. But DNA is not the only form of forensic evidence used in homicide investigations. The above described Corrective Effect may indicate a new theory regarding the drop in homicide clearance in the U.S. over the last forty years: If the 9 open DNA-CMD - 4 cases, out of the 592 cases examined (or 1.5% of all cases), are being kept open *because* of the use of DNA (the lack of a match is preventing the cases from

being cleared, when it could be inferred that pre-DNA an arrest *could* have taken place via older, more subjective investigative methods), and almost all other forms of objective forensic evidence examined here have been found to be predictive of the case remaining un-cleared (Chapter 5), then it would be logical to deduce that a similar phenomenon may be happening with these other forms of forensic evidence as well.

Further, it could be that all forms of forensic evidence, or at least those requiring some time to process may be perceived as only valuable when all other subjective forms of evidence have failed to produce an arrest. As with DNA, but to a much lesser extent, most forensic evidence (i.e. fingerprint analyses, hair and fiber analyses, projectile comparisons) takes some time to process. As such, it could be that investigators turn to most forms of forensic evidence as a 'weapon of last resort' – making it highly improbable, given the nature of the crime of homicide, that such analyses will be able to produce probable cause to make an arrest all on their own.

However, when we look to the last forty years for an influence on homicide investigations that is both ubiquitous and constantly increasing regardless of other social variables, it seems evident that increased use of forensic evidence, or at least an increased interest in forensic evidence, may be a major contributor to the drop in homicide clearance. By way of example, if we *know* it's happening 1.5 percent of the time with DNA, and the regressions conducted (on the 'whodunit' cases) in Chapter 5 note a predictive relationship between the case remaining open and four other forms of objective forensic evidence (Crime scene

photos, Specimens collected, Victim's prior record, and Projectiles recovered) we can see within the present analysis factors which could combine to produce a small drop in clearances as compared to a time when these forms of forensic analysis were either unavailable or investigators had less interest in their use.

This is not to say that by clearing a case without DNA, or another form of forensic evidence, the 'wrong person' was necessarily arrested for the crime. With the ubiquitous rise in forensic evidence over the last forty years, a change in what is interpreted as acceptable evidence in making arrests could have also emerged. As stated before, when forensic evidence is not available, confessions and eye-witness testimony become the only tools available to the homicide investigator in making an arrest. To borrow from an old adage: if all one has is a hammer in their tool belt, every problem tends to look like a nail. If forty years ago, an eye-witness statement was enough to affect an arrest, because it was the only tool available, and today the same level of evidence is not enough to affect an arrest because we have many more tools in our belts, than it could be said that the use of forensic evidence may be related to whatever changes are happening today in relation to homicide clearance.

If fewer homicides are cleared because of the rise in forensic evidence, then two things are immediately apparent. First, we, in the past, may have been clearing a greater number of cases 'incorrectly' than previously believed. However, this term 'incorrect' needs to be understood within its own subjective context. It would seem apparent that if a change in what is considered viable evidence to make an arrest has occurred, then the environment in which arrests

are made has probably changed as well. Explaining this by way of metaphor, 2+2 = 4, and has always equaled 4 – this is a truly objective standard. However, when English was first spoken on this continent words like ‘color’ and ‘armor’ were correctly spelled with a ‘u’ (‘colour’ and ‘armour’ respectively). The environment changed and so did this subjective standard of ‘correct’. The investigation of homicide clearly uses a subjective standard of correct. Fifty years ago the ‘correct’ way to clear a murder was to rely on confessions and eye-witness statements regardless of the presence of physical evidence. Today, the ‘correct’ way to clear a homicide, if there is physical evidence, is to rely in part on what the analysis of that physical evidence has to say.

Second, if the proper utilization of forensic evidence is involved in the drop in clearance then homicide investigators no longer suffer from whatever influence was leading to arrests being made in the absence of forensic evidence. In other words we may be clearing less of them, but the more objective forensic evidence we use, the fewer cases will be incorrectly cleared every year – a fact every homicide department should take a great deal of pride in. Moreover, via this logic we can see that using only the homicide clearance rate as a means of determining effectiveness in homicide investigations may be flawed for a second reason; it fails to account for miscarriages of justice.

It is the position of those conducting the present research that, barring a very small number of notable exceptions, homicide detectives are dedicated civil servants who, with no motive other than the benefit of our society and the people within that society, work very hard to deal with the complex problems inherent

within the career they have chosen. However, as they are human beings they are susceptible to the same influences that mold the opinions and feelings of the rest of society. If the pride found in doing a good job, not to mention the professional mobility of the homicide detective, is tied to making arrests, then we shouldn't be surprised if making the arrest – reaching that level of probable cause – becomes a personal matter for the homicide detective. As such, it would then be naive to think that the process of making an arrest would not be made more complex by the presence of an objective form of evidence placed in the equation – the investigator's performance is now being affronted by something that he/she cannot alter or control. This process in time could influence the investigator in how they view the necessity of using objective forms of physical evidence when making arrests (again, which may be another explanation as to why so few cases used DNA pre-arrest).

The Corrective Effect, as defined and discussed in the present analysis, may in fact be several separate effects. First, the inclusion of certain forms of objective forensic evidence into the homicide investigation **could be** directly altering the outcomes of certain cases that might have been cleared in the absence of that analysis. If this is happening, the present analysis may have found indication of it in the associations between clearance rates certain forms of objective forensic evidence and the ability of certain forms of objective forensic evidence to predict the case not being cleared. Second, the onslaught of various forms of objective forensic evidence felt in the last 40 years may have altered the nature of what is considered a 'correct' investigation – today the presence of this

physical evidence must be respected within the investigative process. Third, the common understanding of the uses and need for various forms of objective physical evidence may be effecting how investigators and prosecutors view physical evidence, furthering the disparity between efficiency and accuracy.

Subjective evidence and clearance

In support of previous research the single greatest predictor of clearance found in the present analysis was the detective fruitfully following up on witness information – as such there exists a connection between the presence/use of subjective forms of evidence and the clearing of a homicide case. The variable 'Detective follow up on witness information provided a new lead' is 50 times more predictive of clearance than any of the objective variables. As such it seems evident that the detective's use of witness information is essential in clearing homicides.

Diagram #2 depicts a model of cases investigated with such subjective forms of evidence (like witness statements).

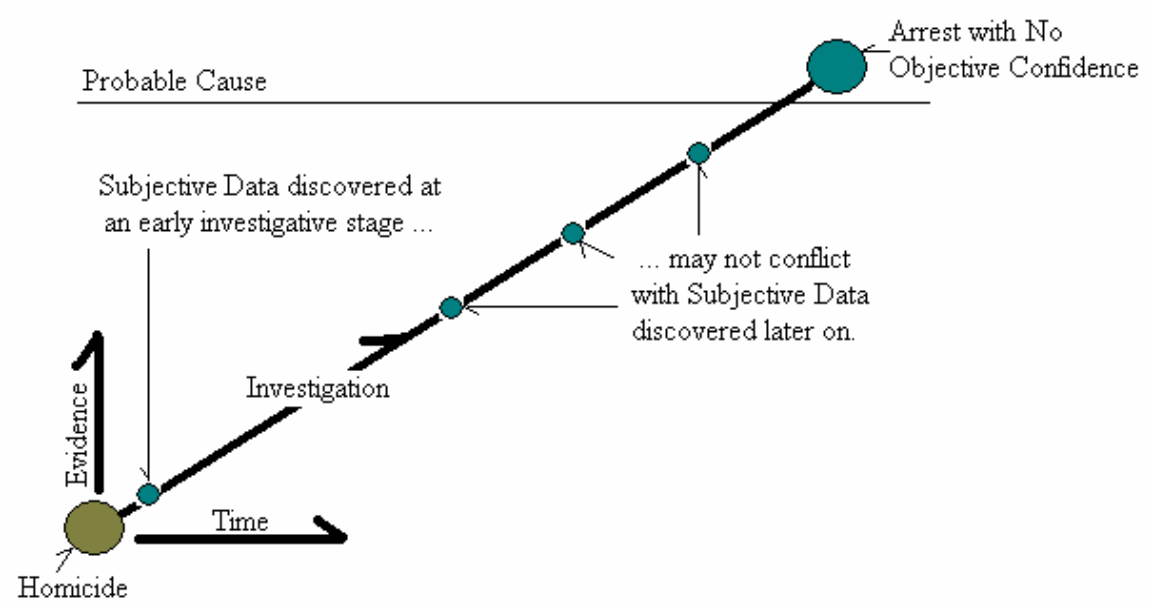

Diagram 2: From subjective evidence to subjective evidence

In this diagram, subjective data which informed the investigation at its inception is not contradicted by subjective data later on, but the arrest results without any level of objective confidence – a reality common to homicide investigations before the influx of the scientific evaluation of physical evidence and a possibility in cases today which are investigated without the aid of DNA analysis (DNA-CMD-1, the largest category of cases examined).

The critical point regarding the above diagram is the fact that subjective information is malleable – it can be altered by the very person who is discovering it in trying to reach the standard of probable cause. Again, this is not to say that this alteration, if it in fact takes place, is inherently bad or done with malice – in fact it is commonly accepted that no two witness statements will agree with each other 100 percent of the time, and discussions of the reliability of memory and the effects of suggestibility on witnesses are common in the criminal justice

realm.[26] In the past (and today, when the objective guidance of physical evidence is not available) it was possible for investigators to use these discrepancies in such a way as to favor whatever investigative tack they may have been on, or even simply to not believe the statements of some witnesses over others. Therefore, conflicting subjective witness statements would have a low probability of altering an investigative tack - if the investigator felt a certain witness statement took him/her farther away from achieving probable cause it could simply be discarded as false. As such it would be highly advantageous for motivated investigators to rely heavily on subjective forms of evidence as they increase the investigator's ability to achieve clearance. The problem here, of course, being that although an arrest has been achieved, the certainty behind that arrest has been made with a subjective standard – it lacks the certainty provided by an objective standard.

Further, the motivation on behalf of the homicide investigator, to use subjective forms of evidence, may exacerbate the perceived effect the popularization of 'crime scene investigation' has had on the public at large (the CSI Effect - discussed in Chapter 4). If prosecutors are needing (or at least believe that they need) more forensic analyses included in the evidence they present to juries in securing convictions in a court of law, and the investigator is motivated to use only subjective forms of evidence in securing a clearance, than a philosophical impasse may be emerging between investigators and

[26] For a comprehensive examination of the most current thoughts on these subjects see Eisen, M.L., Quas, J.A., Goodman, G.S. (2002), *Memory and Suggestibility in the Forensic Interview*, Lawrence Erlbaum: New Jersey.

prosecutors. Both are trying to do their job, but they are working across purposes.

Summary

Despite its potential, no previous research had examined how DNA evidence is used by investigators at the pre-arrest stage of a homicide investigation. The present analysis represents the first examination of DNA's effect on homicide clearance, highlighting the availability of DNA testable samples. As such, it is clear that DNA is having almost no impact on homicide clearance rates. How investigations can be assisted by the creation of large DNA databases is met with skepticism owing to the small number of cases which can be potentially affected by a DNA analysis and the number of open cases in which DNA has matched suspects to crime scenes.

The 'CSI Effect' has provided for a belief in the conventional wisdom that more forensic evidence, the easier the case is to 'solve.' The present analysis dispels this conventional wisdom by suggesting that subjective forms of evidence are in fact used more often in producing higher clearance rates than objective forms of physical evidence. Further, the uses of objective forms of evidence are infrequent and carry much less predictive value regarding cases remaining un-cleared than certain subjective forms of evidence carry in predicting clearance. However, the combined effects of the increased use of objective forms of evidence (the 'Corrective Effect') may have, over time prevented a significant number of homicide cases from being cleared by 1) **possibly** providing

obstructions in reaching probable cause to make an arrest or 2) putting pressure on detective's to, when available use certain forms of objective evidence, although these objectives forms of evidence may not be viewed by the detective as necessary or desirable in generating probable cause to make an arrest in homicide cases.

Appendix A

Homicide Attribute Coding Instrument – Modified (HAC-M)

Adapted from the Homicide Attribute Coding Instrument (Wellford & Cronin, 1999).

All variables are coded as Present or Yes -1, Absent or No – 0. When a variable could not be determined it was coded as Absent or No – 0.

Motivations for Homicide

Motivations known to the police

- Single motivation for homicide
  - Retaliation
  - Drug related
  - Taking property
  - Victim killed while committing a crime
  - Offender defending themselves
  - Victim was a bystander killed inadvertently
  - Conflict over money
  - Rivalry over a lover
  - Victim randomly selected from a particular social group
  - Killed by an authority figure
  - Other conflict (not money or drugs)
- Combination of motives
- Motive unknown to the police

Primary Cause of Death

Shot with a handgun
Shot with other than a handgun
Stabbed
Other
Missing

Characteristics of the Homicide

Eyewitness found at scene
Scene identified as a “drug market”
Involved gang or drug organization member
Involved taking or attempting to take property
Alcohol found at scene
Drugs found at scene
Occurred in a vehicle
Victim killed while committing a crime
Victim killed by an authority figure (e.g., parent, babysitter)
Victim of offender involved in prostitution
Involved sexual assault

Number of Victims per Homicide Incident

1
2
3 or more
Unknown

Relationship Between Victim and Offender for All Cases

Victim knew offender
    Member of the same family
    Romantic relationship
    Friendship/Circumstances

Strangers
Relationship unknown

Reasons for Clearing the Case

Witnesses at scene identified offender
Offender arrested at or near the scene
Investigator identified those who identified the offender
Method of crime linked to offender
Information supplied by others
Physical evidence collected at the scene
Offender dead at scene
Other

Time Between Case Assignment and Clearance

1 day
2 days to 1 week
1 week to 1 month
1 month to 6 months
6 months to 1 year
Over 1 year
Missing

Reasons for Not Clearing the Case

Absence of physical evidence
Witness not identified
Witness intimidated/refused to cooperate
Unable to determine circumstances of death
Unable to identify the victim
Other
Missing

Victim Variables

Sex
Race
Police Officer
Gang or drug organization member
Using alcohol at time of incident
Witness to another crime
Using drugs
Possessing drugs at time of incident
Possessing alcohol at time of incident
History with drug dealers/users
History with drug use
Identified as a drug dealer
Identified as a drug buyer
Prior record for drugs
Prior record for violence
Prior record for property crime
Prior record, any
Buying drugs at time of incident
Selling drugs at time of incident
Alive at scene

Offender Variables

Sex
Race
- White v. Hispanic
- Black v. Hispanic
- White v. Black

Police Officer
Victim and Offender strangers
Victim and offender members of the same family
Victim and offender related by blood
Victim and offender related by marriage
Romantic relationship between victim and offender
Victim and offender friends
Victim and offender live in same household
Victim and offender communicated frequently
Gang or drug organization member

Drinking alcohol at time of incident
Using alcohol at time of incident
Using drugs at time of incident
Possessing drugs at time of incident
Possessing alcohol at time of incident
History with drug dealers/users
History of drug abuse
Identified as drug dealer
Identified as drug buyer
Prior record form drug crime
Prior record for violent crime
Prior record for property crime
Prior record, any
Buying drugs at time of incident
Selling drugs at time of incident
Killed at scene

Weapon Variables

Primary cause of death
- Handgun
- Rifle
- Shotgun
- Knife
- Other
- Unknown

Weapon identified or suggested in police report
Used handgun
Used rifle
Used shotgun
Used “other gun”
Used non-standard ammunition
Used knife
Used blunt object
Used personal weapon
Used fire
Used asphyxiation, suffocation, drowning, or strangulation
Decedent in possession of a weapon
Distance between offender and victim
Total number of wounds inflicted

Drug Variables

Drugs not a circumstance
Incident involved crack
Incident involved powder cocaine
Incident involved alcohol
Incident involved marijuana
Incident involved heroin
Incident involved amphetamines
Incident involved barbiturates
Incident involved PCP
Incident involved Hallucinogens
Incident involved other drugs
Conflict over drug territory
Robbery of drug dealer during drug deal
Robbery of drug buyer during drug deal
Violation of normative rules for sale or distribution of drugs
Retaliation for earlier drug theft
Conflict over quality, type, or amount of drugs
Homicide resulted in an attempt to get money to buy drugs
Failure to pay a drug debt
Conflict over drug paraphernalia
Conflict over drug-using etiquette

General Circumstance Variables

Homicide identified as drug related
Day of the week incident occurred (Monday, 1 … Sunday 7)
Location (private v. public)
Bad weather during the investigation
Drugs at scene
Alcohol at scene
Drug paraphernalia at scene
Scene identified as drug market area
Number of eyewitnesses (at least 1 v. 0)
Gambling
Sexual assault
Penetration by use or threat of force

Offender unlawfully entered a structure
Homicide occurred in a vehicle
Victim or offender involved in prostitution
Offender took or attempted to take property
Offender committed or attempted to commit arson

Motivation Variables

Preemption for anticipated retaliation
Retaliation for prior victimization
Punishment for informing
Conflict over money or property other than drugs
Offender defending themselves
Neglect of an authority figure
Rivalry over a lover
Victim randomly selected from a particular social group
Victim was a bystander killed inadvertently
Conflict over drug territory
Robbery of drug dealer during drug deal
Robbery of a drug buyer during a drug deal
Violation of normative rules for sale or distribution of drugs
Retaliation for earlier drug theft
Conflict over quality, type, or amount of drugs
Attempt to get money to buy drugs
Failure to pay drug debt
Conflict over drug paraphernalia
Conflict over drug-using etiquette
Other drug-using conflict

Detective and Investigative Variables

Number of detectives assigned to case (# = value)
Time for detective to arrive on scene (each value = 10 Minutes)
Other agencies involved
Detective at scene during initial investigation
Detective described crime scene in notes
Search warrant necessary for scene
Detective followed up on witness information
    Follow-up provided new lead

Most important reason in clearing the case
Time between assignment of case and clearance (value)
Most important reason case not cleared

Crime Scene Variables

Crime scene
    Bar/Club v. Public area (street or park)
    Residence v. Public area
Scene secured by first officer on scene
First officer protected scene
First officer notified the homicide unit
First officer notified medical examiner's office
First officer notified crime lab
First officer attempted to locate witnesses
Time between report of homicide and crime scene secured (each value = 10 min)
Evidence technicians at the scene
Length of time evidence technicians were at scene
Number of evidence technicians at scene
Searched for fingerprints/physical evidence
Found fingerprints/physical evidence
Photographed crime scene
Sketched crime scene
Measured crime scene
Weapon found at crime scene
Bullets found at crime scene
Shell casings found at crime scene
Fingerprints found at crime scene
Drugs at crime scene
Clothing found at crime scene

Witness Variables

No witness at crime scene
Who interviewed witness (first officer on scene v. detective)
Time between notification of homicide and witness interviews
Where witnesses were interviewed (crime scene v. headquarters)
Length of time witnesses were questioned (each value = 10 min)
Witness at scene provided valuable information
    Circumstances of death

- Motivation for death
- Identification of offender
- Characteristics of offender
- Identification of victim
- Location of offender
- Identification of vehicle

Homicide captured on surveillance video
Neighborhood survey conducted
Number of officers who conducted the neighborhood survey
Neighborhood survey provided valuable information
Witness found who was not at crime scene (at least 1 v. 0)
Family members of victim interviewed
Friends/acquaintances of victim interviewed
Coworkers of victim interviewed
Roommates of victim interviewed
Neighbors of victim interviewed
Family members, friends, coworkers, roommates, or neighbors provide valuable information

Computer Check Variables

Computer check on decedent
Computer check on suspect
Computer check on witness
Computer check on guns
Computer check on shell/casings
Computer check on vehicles
Computer check on crime scene
Computer check provided valuable information
Computer system used

- Local Criminal Justice Information System (CJIS)
- State CJIS
- National Crime Information Center (NCIC)
- Alcohol, Tobacco, and Firearms (ATF)
- Drug Enforcement Administration (DEA)
- Motor Vehicle Administration (MVA)
- Warrants

Hospital Variables

Decedent went to hospital
Decedent's belongings submitted to evidence control
Attending physician/medical personnel interviewed
Witnesses found at hospital interviewed
    Provided valuable information
Person who transported decedent to hospital interviewed
    Provided valuable information

Medical Examiner's Office Variables

Detective present at postmortem examination
Specimens collected from decedent
Projectiles recovered from decedent
Medical examiner prepared a body chart

Information Variables

Confidential informants used
    Provided valuable information
Other police officers used
Surveillance used
Witness came forward on their own

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