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Comments

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

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Abstract

Homicide clearance rates in the United States have been dropping steadily since the late 1960s. The literature on homicide clearance has yet to explore exactly what effect DNA evidence is having on the homicide investigation. As such, the increased use of DNA as an investigative tool to raise 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, the implications of the use of DNA may point to a larger phenomenon which may have contributed to the drop in clearance experienced nationwide.

DNA and Homicide Clearance: What's really going on?

Homicide clearance rates have dropped considerably in the United States since the late 1960s (Bureau of Justice Statistics (BJS), 2002c; Federal Bureau of Investigation (FBI), 2006; Regini, 1997; Wellford & 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 did in the past. Despite its potential, little is actually known about how DNA evidence is used 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 is having on homicide investigations, much less how this potential might be enhanced.

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 (Addington, 2006; Litwin, 2004; Regoeczi, Kennedy, & Silverman, 2000; Reidel & Rinehart, 1996; Wolfgang, 1958). Only one study has specifically examined investigative procedure in relation to clearance (Wellford & Cronin, 1999).

Conventional wisdom proffers the idea that forensic evidence helps in solving homicide cases (Fisher, 2000; Gaines & Kappeler, 2005; Geberth, 1983, 1996; Gilbert, 1993; Inman & Rudin, 2001; Lyman, 1999). However, this conventional wisdom assumes that the forms of evidence that were used before DNA became available were not as good at producing clearances as DNA is today. The notion that DNA 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; therefore, the possibility exists that conventional wisdom may be in error.

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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, 2000). 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, 98% 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).

DNA and the Corrective Effect

Confessions, eye-witness identifications, and witness statements are all forms of evidence which are subjective in nature and can be in error, or they can change (or be changed) over time (Cutler & Penrod, 1995; Fabian, Stadler, & Wetzels, 1995). 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; experts with differing forensic interpretations of physical evidence are frequently found on opposite sides of a case during trials. However, at the investigative level, once a determination has been made by a forensic expert (i.e. fingerprint examiner, coroner, ballistics examiner), investigators generally are not at liberty to question the veracity of that forensic determination (Fisher, 2000; Gaines & Kappeler, 2005; Geberth, 1983, 1996). Therefore, an analysis of how this shift from subjective forms of evidence 40 years ago to the use of an objective form of evidence, like DNA, has impacted homicide clearance seems like the logical next step.

Research into another violent crime has already found that objective DNA evidence does prove to exclude from suspicion the tested suspect in a significant number of cases. When studying sexual assault, the National Institute of Justice (1996) noted that in one-quarter of sexual assault cases referred to the FBI, the primary suspect had been excluded by forensic DNA testing. 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"—the excluding of suspects from suspicion by the use of objective physical evidence—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).

Prior Research on Circumstances of the Homicide Event

Marvin Wolfgang (1958), in his seminal work conducted within the city of Philadelphia, examined homicides committed between January 1, 1948 and December 31, 1952. This was the first time in the literature that an assertion had 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 proportions 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 examining 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 before a suspect has been found. All of the other variables seem to be objectively observable from the moment (or very shortly thereafter) the homicide is discovered, and all are things that homicide investigators would have almost no ability to affect.

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.

Wolfgang (1958) also addressed many 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—and yet the homicide clearance rate remained above 90%.

Reidel and Rinehart (1996) examined 3,066 Chicago murders, committed between 1987 and 1991. They found 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 or investigative tack, on the other hand, is something the homicide investigator has total control over (Fisher, 2000; Geberth, 1996).

Regoeczi, Kennedy, and Silverman (2000), noting that the drop in homicide clearance in the U.S over the last 40 years is similar to the drop in homicide clearance experienced in Canada over the same time period,[1] 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).

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 (i.e. DNA) 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 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 four conclusions regarding homicide clearance: homicides in African American neighborhoods have lower clearance rates; extralegal

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[1] 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).

factors such as the victim's race do not affect clearances; detective workload does not affect clearances; and detectives work hard to clear all homicide cases.

What is of direct relevance to the current study is an observation made by Puckett and 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 and Lundman (2003), relying on the Locard Exchange Principle,[2] 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.

Litwin (2004) analyzed data from the Chicago Homicide Dataset for the years 1965 through 1995 by examining factors affecting homicide clearance which are primarily "nondiscretionary"—factors those investigating the homicide could not affect. 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. 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 un-cleared.

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). The discretionary variables that he sought to test were 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).[3] 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, the greater the chance the case will be cleared (whether Litwin classifies it as "discretionary" or not).

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

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[2] 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).

[3] 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.

dataset,[4] her focus remains set on 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 uncleared. However, by analyzing NIBRS data, Addington's (2006) 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 (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

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

databases of various types were also strongly correlated with clearance (Wellford & Cronin, 1999).

Puckett and 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 and 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 and 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 objective physical evidence may simply be 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.

Homicide Clearance, DNA, and the Corrective Effect

The conventional wisdom mentioned above would require changes to how murders are being conducted or in the relationships or conditions which exist between victim and offender to explain the drop in homicide clearance experience in the last 40 years (which undoubtedly has happened to some degree).[5]

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 objective forms of forensic evidence; DNA being the most prominently discussed today. 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) Could a "corrective effect"—the effect of the increased use of DNA—be related to the drop in homicide clearance?

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

Method

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 what the DNA analysis accomplished within each investigation was conducted with respect to 4 categories: "victim only DNA," "direct link between a tested suspect and evidence from the crime scene," "database could provide further lead," and "insufficient DNA for analysis."

The Borough of Manhattan is uniquely suited to this study as Manhattan is one of the most densely populated areas in America. Therefore, 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 for which previous research has indicated DNA evidence would figure more prominently. Also, one would expect the experience of Manhattan homicide detectives[6] 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

The cohort of homicide case files within the Borough of Manhattan from the years 1996—2003 was sought. Out of the total 1,037 case files, 10 were determined to be incorrectly recorded (they in fact were not homicides) and 80 files were cleared as "exceptional" or "justifiable"—both designations irrelevant to the present analysis. Out of the remaining 947 case files, 354 (or 37.4%) were unavailable leaving a total of 593 files examined. However, the clearance status of each unavailable file was still determinable via information provided by the Homicide Analysis Unit of the NYPD. Cases 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.

Each located file 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 action by the two agencies responsible for all serological analysis requested by the NYPD (The Forensic Investigation Division of the NYPD and the Office of the Chief Medical Examiner). 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.

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

[6] 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.

murder had 1) found or considered DNA evidence relevant to the investigation, 2) requested any DNA analysis, 3) had that analysis available to assist them (i.e. implicate a known suspect) 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 not a factor in the investigation; DNA-CMD-2, DNA analysis was requested, but not used; 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 subject. The homicide case's clearance status serves as the dependent variable—the case is either open or cleared by arrest. The DNA Case Models themselves will serve as independent variables in examining how clearance is related to each case model. Solved and unsolved cases (the clearance rate) for each category is then calculated and used in exploring the efficacy of DNA evidence in clearing homicide cases.

Hypotheses

The size and clearance rates of DNA CMD-3 and 4 will be used to examine hypothesis 1: DNA evidence has played a substantial role in clearing homicide cases in Manhattan from 1996 to 2003.

The clearance rates for each of the four DNA-CMDs will be used to examine hypothesis 2: Cases with DNA analyses (DNA-CMD-3 and -4) will have higher clearance rates than cases without DNA analyses (DNA-CMD-1 and -2).

The number of cases in which evidence was collected and not examined (DNA-CMD-2) and the clearance rate of this group will be examined in testing hypothesis 3: The building of large DNA databases will significantly assist in raising the homicide clearance rate.

An examination of what the DNA in each case actually accomplished will be conducted in testing hypothesis 4: Has a "corrective effect" caused by the use of DNA evidence been related to the drop in homicide clearance?

Results

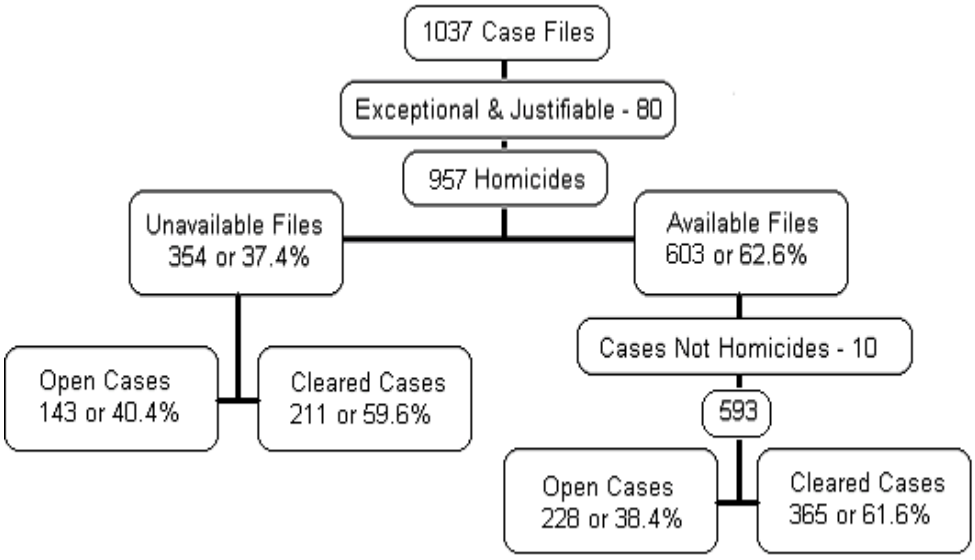
Clearance Rates by Year

From Figure 1 it can be seen 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.

Figure 2 displays the clearance rates for the available and the unavailable files, as well as Manhattan overall, and the U.S. overall, per year. 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 this 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.

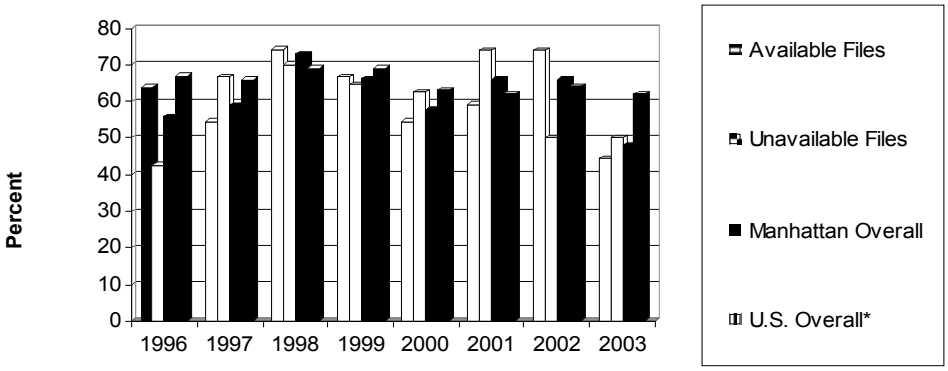
Figure 1.
Overall homicide clearance rates for the Borough of Manhattan, New York City, by file availability, 1996 through 2003



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 cases had 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 files overall was 11.5%.

Figure 2.
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

The Available Files

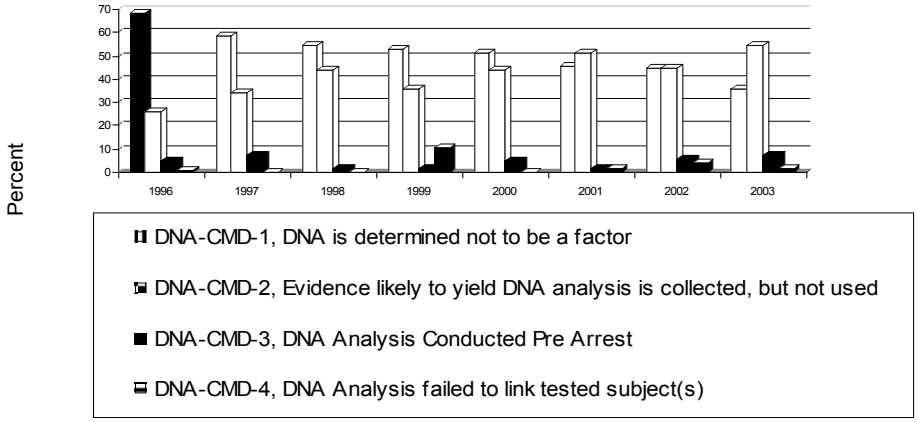
Figure 3 indicates that in 1996, evidence likely to produce a DNA analysis was not collected (and therefore presumably not perceived to be a factor in the investigation) in over 65% of the homicide cases. This percentage drops consistently each year and by 2003 has dropped to around 35%. As expected, 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, within 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% were affected by a DNA analysis pre-arrest.

The next logical question—how often is DNA being used in relation to how often evidence likely to yield a DNA analysis is taken from crime scenes?—is assessed by determining the number of cases which could realistically need the help of a DNA analysis in relation to the number of cases which have used a DNA analysis (N = 40). From Figure 3 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 conducted in 14.8% of the cases in which a DNA analysis could possibly be conducted. It would therefore seem that homicide investigators are seeking the objective/scientific certainty provided by a DNA analysis

in a very modest number of cases in which such an analysis is possible before making an arrest.

Figure 3.
Percentage of DNA Case Models per year



However, to properly analyze this 14.8% in context we must first ascertain: For how many cases is the certainty provided by DNA really necessary in affecting 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 (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[7] 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 analysis

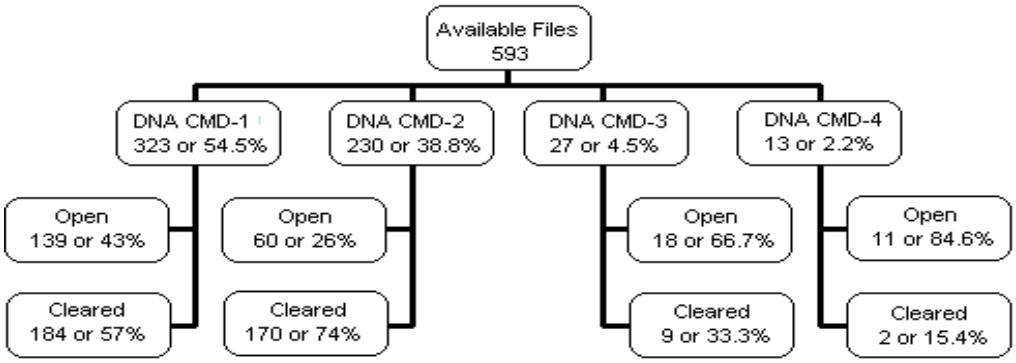
[7] It should be noted that 5 of the 947 cases did not have clear dates stated for the commission of the offence or the date of clearance.

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 the total number of whodunit cases from DNA-CMD-2 (N = 136) is combined with the original 40 DNA cases, a total of 176 cases that could feasibly be affected by a DNA analysis are noted. 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, it is actually being used (feasibility being determined by both the collection of evidence likely to yield a DNA sample at the crime scene and the lack of an immediate solution [whodunit]). It would seem that even when testing the utility of DNA evidence within the context of Simon's (1991) dichotomy (dunkers and whodunits), DNA analysis is not conducted very often, even when evidence likely to yield a DNA analysis is available. Therefore, in deference to hypothesis 1, DNA alone could not have had a substantial effect on homicide clearance within the Borough of Manhattan. Possible reasons for the infrequent use of DNA analyses in homicide cases are discussed below.

Figure 4.
Overall homicide clearance rates for the Borough of Manhattan, New York City, by DNA-Case Model Designation - 1996 through 2003



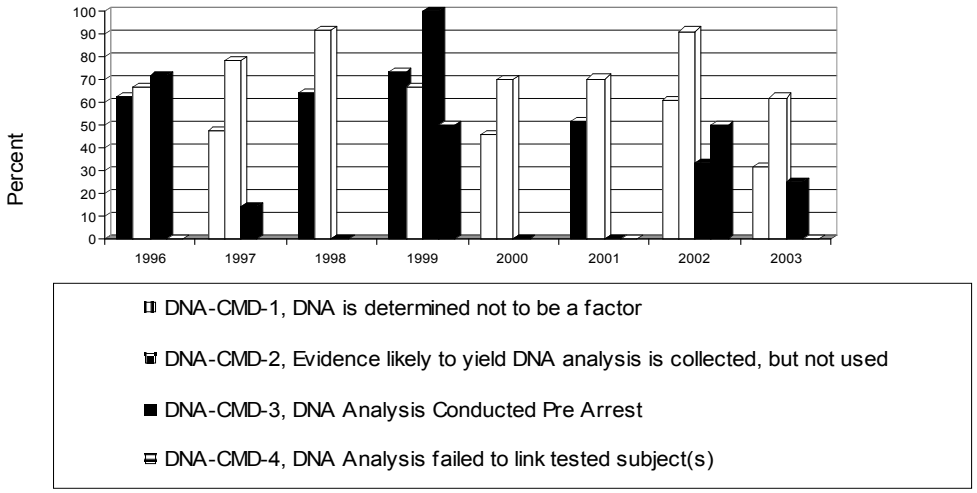
Note: DNA CM-1: DNA not relevant to the investigation;
DNA CM-2: DNA was requested, but not used;
DNA CM-3: DNA analysis available pre-arrest;
DNA CM-4: DNA analysis failed to implicate a tested subject

Clearance rates of the DNA-CMDs

The overall clearance rates of each DNA-CMD can be seen in Figure 4; a year by year breakdown is visible in Figure 5. 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, per year, wildly fluctuating clearance rates; DNA cases have an overall clearance rate of 27.5%.

At first glance, Figure 5 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. However, what is clear is that in deference to hypothesis 2, homicide cases which have used a DNA analysis do not have higher clearance rates than non-DNA cases.

Figure 5.
Clearance rates of DNA Case Models per year



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 (Fisher, 2000; Geberth, 1996), 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 that are still open. From Figure 4 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%); 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 only the victim's DNA (Table 1). Therefore, if we are to expect that 40% of the time DNA taken from homicide crime scenes will only come back to the victim, the resulting number of cases which would most likely be afforded a DNA match between a suspect and evidence from a crime scene by the use of a large DNA database drops to 54. In other words, 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 overall homicide clearance to be approximately 9.1% (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—the ability 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 they both shared (bedroom, bathroom, or kitchen), 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.

From Table 1 it is evident that in 6 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 five separate male donors, all of which were already under suspicion, the DNA analysis did not serve to assist an arrest, as the DNA analysis did not provide the police any new information. In fact, there existed myriad convoluted issues regarding the uses of the DNA analyses within the 40 cases examined. As such, it would be erroneous to believe, even if DNA databases could provide all of the cases in DNA-CMD-2 with matches between known individuals and evidence from crime scenes, that they would end up being cleared because of it.[8] Therefore, in deference to hypothesis 3, it would seem likely that the creation of large DNA databases will not assist in significantly raising the homicide clearance rate. Hypothesis 4 will be addressed in the discussion section below.

Table 1.
How DNA evidence was used in each of the 40 DNA cases (CMD-3 and -4)

	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

Note: 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.

Discussion

In using a DNA analysis, the most salient variable in deference to a homicide investigation is the time involved in processing the evidence in question. The shortest turn-around time for the scientific analysis of DNA evidence in any of the 40 DNA cases examined was several weeks—the longest was several years. Clearly the

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

establishment of an investigative tack (if not the resolution of most homicide cases which are cleared) would have taken place within the first several weeks of an investigation (for example, 69.44% of the cleared cases examined in the present study were cleared within one month). Further, because of the delay and expense[9] 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 (N = 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 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: twice as many cases in 2003 had evidence likely to yield DNA (DNA-CMD-2) taken from crime scenes than in 1996, and this Case Model Designation has the highest overall clearance rate. From this it could be concluded 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, Gaffney, Lovrich, and Johnson (2006) 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

[9] 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. By 2007 that cost has been projected to drop to approximately $300 or less.

(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 suspect's 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.

Clearly society wants 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 (Simon, 1991). In other words, homicide detectives are highly motivated to make arrests. The number of "whodunit" cases in DNA-CMD-2 and its overall 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 probable cause to make an arrest. 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. Whatever the outcome of analyzing all possible DNA evidence found at homicide crime scenes, Table 1 indicates that a significant number (11 out of 40, or 27.5%) of DNA analyses have excluded a tested subject and remained open. However, that means that only 1.8% of the total number of cases (11 out of 593) could have been corrected by a DNA analysis. Therefore, in deference to hypothesis 4, a corrective effect fostered by DNA evidence alone is impossible for this sample. However, how all forms of objective physical evidence working together over the last 40 years may have produced a corrective effect has yet to be examined, and therefore is an excellent area of future research.

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. 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 22.7% of those whodunit cases which collected evidence "likely to yield a DNA analysis" (DNA-CMD-2) had a DNA analysis available to them pre-arrest. Further, the creation of larger DNA databases will most likely only modestly raise homicide clearance (at most 9.1%), given the number of cases which can be assisted by a DNA analysis and the number of direct DNA 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. 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. The use of DNA analyses may not help a great deal in increasing clearance rates, but it may stop the

police from making a certain number of arrests in cases where DNA evidence is analyzed and provides information favorable to the accused (i.e. the corrective effect).

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 must be provided the benefit of that analysis. Only then can we get some adequate understanding of how DNA evidence has, and can, assist in increasing the efficacy of homicide investigations.

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