THESIS

AN ASSESSMENT OF PREVIOUSLY UNRESOLVED HOMICIDE CASES IN

COLORADO TO INVESTIGATE PATTERNED OUTCOMES LEADING TO

RESOLUTION

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ABSTRACT

AN ASSESSMENT OF PREVIOULSY UNRESOLVED HOMICIDE CASES IN
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The purpose of this research is to consider whether specific characteristics of an unresolved homicide impact whether it is likely to be solved and what the implications of the findings mean for the future. First, a review of the literature proposes that urbanization and other factors have resulted in the dramatic decline of homicide cold case clearance rates and examines the factors associated with case clearance, including case-specific as well as departmental responses.

To assess relationships across previously unresolved homicide cases, data were collected and coded from a list of *solved* Colorado cold case homicides from 1970 to 2017. An initial qualitative analysis of the data (N=111) was completed, and exploratory correlative tests were implemented to investigate patterned outcomes moving from the cause of death towards factors that assist in cold case homicide resolution.

The analysis suggests, among others, that access to resources, specifically a Cold Case Unit, leads to greater likelihood of case resolution in certain causes of death, not including death by firearm. There is support for findings from prior literature on the topic which argue that level of funding is crucial to cold case investigation. Given the implications of this important topic, more research is needed to better understand the relationship between cold case homicides, factors involved in the solvability of various cause of death, and for the use of specialized Cold Case Units.

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This thesis is dedicated to my children, Chloe and Taylor and my husband, Bobby. I am grateful for their love, support and for the sacrifices they have made as I pursue my academic and professional career.

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CHAPTER 1. INTRODUCTION AND LITERATURE REVIEW

Do the specific characteristics of a homicide impact whether or not it will be solved? Are there agency-specific factors that also affect the solvability of a homicide case, specifically one that is not resolved soon, i.e., it has gone "cold"? If so, what role does research on these topics play in contributing to improve falling homicide clearance rates? These questions remain ongoing issues for both academia and law enforcement. This introduction and literature review considers the history of and research surrounding cold case homicide rates and homicide investigations.

It is important to examine the historical and current research regarding the phenomenon of "Cold Case Homicides" in our nation. The first section of this chapter begins with a history of unresolved homicide. Important definitions, the dramatic decline in homicide clearance rates, and what is required to "clear" a case are considered. The second part of this first section discusses some of the main reasons that have been identified for falling clearance rates, including: urbanization, changes in the nature of homicide, community mistrust in the police and ultimately, low funding. This section provides an introduction to the concept and offers explanations for plummeting clearance rates across the country.

Section two of this chapter focuses on the factors associated with homicide case clearance. I begin with a look at how investigators can systematically screen cases by weighing the investigative potential for the solvability of a specific case. Research is presented that considers certain factors associated with case clearance. Specifically, solvability potential can be seen in case-specific factors as well as agency characteristics or investigational factors. Case-specific factors include the demographics

of a victim or specific weapon used in the homicide, whereas agency/investigational factors include characteristic such as, number of detectives on a case, available investigative resources, funding, etc. There is an extensive amount of research that focuses on best practices and a review shows that a mix of organizational, support and investigative factors are all at play when it comes to the ability to clear cases. This section shows that case clearance can be positively impacted by focusing on the specific (case and agency) factors that increase the potential for solvability and thus impact overall clearance rates.

The third and final section of this chapter considers police departmental responses to declining clearance rates. By looking at the importance of agency cooperation in case clearance, we can also see the significance of technology. Specifically, advancements in DNA technology and the introduction of databases of unresolved homicides and DNA gathered from suspects and convicts have changed how law enforcement deals with cases, specifically the investigation of cold cases. Increased agency cooperation, advancements in technology and the rise of cold case units, suggest the potential to positively affect cold case homicide clearance rates.

In sum, this introductory chapter provides a review of the history of unresolved or cold case homicide; considers various factors associated with its clearance, and describes many of the recent law enforcement responses to declining clearance rates.

1. Introduction

In this first section, I introduce the concept of a "cold case" and discuss the history of unresolved homicide, including definitions of a number of important terms. The following section explains the massive decline in clearance rates seen in the past few decades, and provides reasons for why this major shift has occurred.

1.a. History and Definitions

The term, "cold case", refers to an unsolved (or unresolved) homicide, and has been widely researched since the introduction of the term in the late 1950's and1960's. Historically, we first see the term "unresolved homicide" in the famous 1958 book, "Patterns in Criminal Homicide", by pioneering homicide researcher and sociologist, Marvin Wolfgang. According to Wolfgang (1958), there are four criteria for a homicide to fit the categorical definition of "unresolved homicide". These include when: a suspect has been arrested, but not convicted; a suspect has been arrested but no trial has been held; a suspect is known to police but has escaped; or no suspects have been identified (Wolfgang 1958). This well-known book marks the beginning of the academic study of homicides along with cold case research and factors involved in police investigations of such cases.

The number of unresolved homicides increased rapidly in the 1960's and 1970's. By the late 1980's "the sheer volume of unsolved cases had become overwhelming" (Davis, Jensen and Kitchens 2011:4). This was mainly due to a dramatic decline in solution rates. The "solution rate" is also known as the "clearance rate", is the percentage of solved homicides compared to the total number of homicides that occurred. Between 1960 and 1983, solution rates declined dramatically, "from over 90% to approximately 76%" (Davis et al. 2011:45; Holmes and DeBurger 1985; Keppel 1992:13). While there is now an extensive research literature that has focused on understanding how homicides are solved, clearance rates still remain low (Hough, McCorkle and Harper 2019:178). From 2020 to 2022 the clearance rate for homicides in the United States continues to still fall and currently sits at just below 50%, with 10,904 total incidents and 5,430 solved cases (FBI 2020, Li 2022).

The concept of "clearing a homicide case" does not always mean that an arrest is made and/or a suspect is convicted. Clearance can be affected by "events outside police control" that do not allow arrest, charging and prosecution (FBI 2004). For example, these circumstances could include inability to contact suspect(s), deceased suspect(s), inconclusive DNA results, etc. (Davis et al. 2011:xii). These previous examples are a type of exclusion commonly labeled *exceptional clearance* and defined as, when a "suspect has been conclusively identified and evidence collected but prosecution is impossible because offender is unavailable, either dead, in prison, unable to locate or suspect entered plea that is before prosecution" (Davis et al. 2011:xiii).

Research, some of which has been cited above, shows that the concept of "cold case" predates the 1980's (Davis et al. 2011:4). However, it was not seen in print until a 1980 news article that discussed arrest and conviction in a 26-year-old homicide case (Press 1986). Definitions of "cold case" vary widely as there is no "universal accepted metric for when a case becomes 'cold'" (Davis et al 2011:4). Some agencies "arbitrarily use the passage of 1 year as a boundary" (Davis et al 2011:4), while others define it as "a homicide investigation that is open for more than three years from the date of the commission of the crime for the crimes committed after 1970" (Salazar 2018:5; Rogers and Unnithan 2022).

1.b. Reasons for Declining Clearance Rates

This section highlights several reasons why the cold case rate has increased at the same time as clearance rates have decreased. Urban growth and specifically, the declining clearance rates of large, urban law enforcement and prosecutorial agencies

are among the major factors associated with falling cold case clearance rates. The rapid growth of urbanization led to changes in the nature and type of homicide, such as an increase in stranger-on-stranger homicide, mistrust in the police and increases in gun and gang-related violence. Another major roadblock to case clearance is lack of funding for investigative work. In sum, this section takes a closer look at the "variety of explanations for the lack of success in solving homicides" (Davis et al. 2011:1).

"The problem of falling clearance rates had become acute" (Davis et al. 2011:3) and research was being done in regards to the factors affecting solvability of a case. This section outlines the some of the major explanations offered by criminologists for this sudden decline in clearance rates.

During the 1970's and 1980's, the US experienced a surge in urban growth (Davis et al. 2011:2; Gilbert 1983; Keppel 1992:14). Along with urban growth came a sharp decrease in cold case clearance rates in urban areas (Gilbert 1983; Richardson and Kosa 2001). From 1972-1992, clearance rates dropped from 90% to 77% in Illinois (Keppel 1992:22). Many characteristics that are associated with urban crime have made homicide cases harder to solve. For example: there are changes in the nature of homicide, with increases in gun and/or gang-related violence, etc (Davis et al. 2011:2; Wellford and Cronin 1999). Large cities have been reporting especially low clearance rates (Davis et al. 2011:3). In 1979, the homicide clearance rate for NYC was only 43% (Keppel 1992:22) compared to the national rate of 72% in 1980 (Project: Cold Case 2022). Generally, research shows that as urbanization increases, clearance rates will decline.

Scholars argue that urbanization has changed the very "nature of homicide" (Davis et al. 2011:2). Gilbert (1983) notes that between 1970 and 1980, California experienced

a 170% increase in homicides and attributes the growth to an increase in stranger-on-stranger homicide. In the 1960's, most homicides were between people who knew each other to some extent, but by 1992, 53% of all murders were between strangers (Cardarelli and Cavanaugh 1992). Studies suggest murders that occur between strangers are the most difficult to solve (Gilbert 1983; Rojek1996), clearly making this an important factor in explaining the overall drop in clearance rates.

A 1994 study by T.A. Rinehart looked at several aspects of homicide cases and found the following investigative factors had the greatest effect on clearance rates: contact homicide unit, medical examiner's office and a crime lab, secure crime scene, looking for witnesses, detectives on site within thirty minutes of crime scene discovery, multiple detectives assigned (three or more), database checks on all parties/evidence, thorough interviews with witnesses, family members, acquaintances and neighbors of the witness (Davis et al. 2011:3; Rinehart,1994).

Cultural reasons may also contribute to decreasing clearance rates. A 1999 study by Riedel and Jarvis (1999:294-295) suggests that a distrust of police contributes to falling rates. In poorer, high crime areas, the public is less likely to be trusting of the police and therefore may be unwilling to help with investigations. (Davis et al. 2011:2; Keel, Jarvis and Muirhead 2009:50). Furthermore, witnesses to homicides may fear retaliation and thus be even less trusting of law enforcement (Borg and Parker 2001; Keel et al. 2009:50). Immigrants may fear deportation and be reluctant to cooperate with government authorities (Davis et al. 2011:2) especially the police. Rinehart (1994) finds that police-community relations and characteristics of a community make for the greatest effect when it comes to cold case clearance (Davis et al. 2011:3). Mistrust in

law enforcement contributes to lack of witnesses, unwillingness to cooperate and thus, results in falling clearance rates.

This time-period also marked changes in the type of weapon most commonly used in homicides with increases in the use of guns. Studies show homicides involving firearms are less likely to be solved than cases where other weapons (Addington 2006) are used. The use of guns makes it more difficult to solve the crime given that it makes leaving DNA at the scene less likely (Davis et al. 2011:2) than other forms of homicide where there is some degree of contact between the offender, victim, and possibly witnesses.

There are also reports of increases in drug and gang-related homicide (Alexander and Wellford 2017:544; Davis et al. 2011:2; International Association of Chiefs of Police (IACP) 1995). These are common factors in urban homicides and homicide by firearms. Looking at various types of homicide, such as, "gang-related homicides, workplace and school shootings, medical/elder homicides and terroristic killings, can reveal certain factors that lead to higher clearance rates" (Alexander and Wellford 2017:544). It is clear that homicides involving firearms or gangs have increased and this has also contributed to falling clearance rates.

Low funding is another key factor when it comes to assessing and explaining plummeting homicide clearance rates. Davis et al. (2011: xii) conclude that level of funding is directly related to clearance rates. Several studies show that higher, "level of funding and access to investigative resources" increases the chances of successful case clearance (Borg and Parker 2001; Greenwood, Chaiken and Petersilia 1977; Keel et al. 2009:52; Marche 1994), whereas other studies show little to no impact (Borg and Parker 2001; Greenwood et al. 1977; Keel et al. 2009:52; Marche 1994). An appropriate

level of funding is important for a police department to carry out the training needed for homicide investigations (Keppel 1992:13; Naday, Unnithan, Shelley and Hogan 2009; Salazar 2018:5). Since the 1980's, law enforcement agencies have voiced their need for better funding for training purposes (Keppel 1992:13; Salazar 2018:5). For example, in Colorado, the CBI (Colorado Bureau of Investigation), uses funding for training on a variety of topics to increase case clearance, including the following: why cases go cold, investigative basics, resources available, formation of cold case squads, case selection, case review process, working with co-victims, case resolution, etc (Salazar 2018:6). It is clear funding is crucial and the level of funding often determines the resources available to assist cold case investigators.

In review, the previous section discussed the importance of cold case/unresolved homicide by looking at the history and important definitions surrounding the topic. Research on the issue of plummeting clearance rates provides explanations for the drop seen in the past few decades. The impact of urbanization, changes in the nature of homicide and lack of funding for police departments are discussed and have been shown to be major factors contributing to overall declines in cold case clearance rates.

2. Factors Associated with Clearance

This second section of this literature review looks at several factors associated with cold case clearance. Research examining various factors related to falling clearance rates and increasing caseloads is considered (Davis et al. 2011:2). This helps us understand the kinds of cases that are likely to be cleared. Historically, studies have focused on the case/demographic factors of a case, while more recent research looks at factors associated with the agency and the investigation itself. Recent research has also led to investigative changes in the systematic screening and solvability potential of a cold case. These various factors are considered below.

2.a. Case/Demographic Factors

With more public attention and increased pressure due to falling clearance rates, law enforcement agencies began to "screen cases for [their] highest solvability potential" (Davis et al. 2011:43). "Systematic screening of cold cases for their investigative potential is most likely to occur when homicide units are looking for ways to increase their clearance rates by identifying cases that can be exceptionally cleared" (Davis et al. 2011:43). A 2017 study by Alexander and Welford "highlighted the little we know about why homicides are not cleared and what we can do to increase clearances that result in correct conviction" (544). This study argues that it is not "how solvable a homicide is, but rather what level of effort is necessary" (Alexander and Wellford 2017:543). For example, to clear a case due to exceptional clearance, i.e., because an offender is dead, would require minimal effort and thus have high investigative potential. The following is a review of various studies that have identified various factors associated with high clearance rates, or those with the highest solvability potential.

A study by Davis et al. (2011:44) found several case and demographic factors associated with higher case clearance. For example, a case is more likely to be solved if it includes any of the following factors: it occurred recently (time frame not clearly defined), does not involve a drug user, or if the body was found in a private residence (Davis et al. 2011:44). This research suggests that demographic factors are important, as cases involving victims that are *young* (age range not clearly defined) or *male* often result in higher clearance rates (Davis et al. 2011:44). Social status is another important demographic factor to consider, as cases involving victims from lower social status often experience less case clearance than victims who belong to a higher social class (Keel et al. 2009:53). Other factors associated with higher case clearances are related to the investigation itself. These include cases that have: a known motive, a developed theory or if a suspect has been identified (Davis et al. 2011:43). Davis et al (2011:43) suggest that the inclusion of a lineup in the investigation is related to increased case clearance. Keel et al. (2009:52-53) add other factors including, "availability of witnesses and effective information, detective experience and volume of cases, circumstances and motives". Their findings clearly suggest that the specific factors in an unresolved homicide such as, those associated with a given case and demographic information will affect its solvability potential.

2.b. Agency/Investigation Factors

Research suggests that specific factors related to agency and investigations are also associated with successful case clearance. It is noted that 80% of all homicides are solved by the responding officer or based on information provided by the victim and/or witnesses, rather than true investigative efforts (Davis et al. 2011:xiv). Similarly, Keppel (1992:10-11) posits that a "successful …murder investigation is dependent upon a

combination of several solvability factors". These include the following: quality of eyewitness interviews, quality of investigation at the crime scene, and quality of scientific analysis of physical evidence (Keppel 1992:10-11).

In 2013, Carter released a list of best practices to aid in cold case clearance. These are broken up into organizational, support and investigative categories. Similar reviews suggest additional factors that this section explains in more detail. I first discuss the *best organizational practices*. Organizational best practices include, "adequate budget, staffing, ties to medical examiner, labs, the media, community, creates crime-stoppers programs, [and] provide equipment/car for detective[s]" (Carter 2013). A review by the Bureau of Justice Assistance (BJA) appraised high performing agencies and offered a list of "best practices" regarding procedures "law enforcement can do to positively impact homicide clearance" (Alexander and Wellford 2017:542). The BJA's *organizational best practices* are similar to Carter's (2013), but also include, "invest in relationship with homicide unit, system in place for standardized and structured management of investigations" and "build partnerships for information and cooperation" (Alexander and Wellford 2017:542). These organizational best practices suggest that inter-agency cooperation, information sharing, and funding are critically important to increasing cold case clearance success.

Research suggests these best practices are also relevant when considering the support functions that affect cold case clearance. Carter (2013) suggests best practice support functions, including information sharing systems, training for investigators and the use of specialized units. The BJA also recommends best practice information sharing. Factors such as funding and the sharing of information are clearly imperatives

for support functions to be a possibility. The availability of databases, training, and specialized units all require funding at hand for the resource to be available.

In Carter's (2013) review, *investigative factors* were the largest set of "best practices". These include best practices such as: constant training, team approach, video-recording interactions and interviews, review cases, seek federal funds, [and] maintain well-documented case files" (Alexander and Wellford 2017:543, Carter 2013). Alexander and Wellford (2017:542) suggests investigators should be supported with appropriate resources, assessment of current response to victims/survivors. This study found several investigative factors that are shown to be important in case clearance, especially regarding to the valuable, "quality of processing the crime scene" including quality interviews and evidence.

To summarize, increased attention to cold case clearance rates has led to research on the factors that contributed to falling clearance rates. Thus, law enforcement began to systematically screen cases for their solvability potential in efforts to increase case clearance. A review of the research shows a mix of case-specific and demographic and organizational factors affect the solvability of a certain case. Best practices are suggested for organizational, support and investigative factors that are shown to benefit and improve case clearance rates.

3- DEPARTMENTAL RESPONSES TO DECLINING CLEARANCE RATES

The third and final part of this literature review will focus on departmental responses to declining clearance rates. Improvements in cold case clearance stems from cold case research and contribute to best practices regarding procedures law enforcement can follow to positively impact cold case clearance, as discussed in the previous section. This section explores forms of departmental response to declining rates. Types of departmental responses discussed below include recognizing the importance of inter-agency cooperation, advancements in DNA and other forensic technology and the development of dedicated cold case squads.

3.a. Agency Cooperation and Cold Case Units

Declining cold case clearance rates led to increased attention and a growing literature on the need for cooperation between agencies (Keppel 1992; Stewart 1980). Keppel (1992) suggests that improvements require better methods of sharing information. The increase in cold cases has led to increased inter-agency and intra-agency coordination, as well as better organization of crime investigations (Keppel 1992:15; Repetto 1975; Stewart 1980).

Due to advancements in coordination, information storage and accessibility has played a critical role in solving crimes (Keppel 1992:16). In the past, information regarding cases would be obtained by members of the police agency discussing cases with each other and by detectives using available police records. This earlier type of information storing and sharing is not optimal for solving crimes between agencies, across county or state lines. Keppel (1992:16) suggests "more emphasis should be placed on *cooperation and information sharing* among police officers and detectives"

and that attention should be paid "to how criminal records are filed and organized to make sure that they are easily accessible by investigators".

Prior to the 1990's, information was "mostly stored in the minds of individual police officers" (Keppel 1992:17). Low clearance rates required improvements in police effectiveness and information sharing between agencies in order to "receive, collate and disseminate this type of information" (Keppel 1992:17; Willmer 1970). Historically, dental or fingerprint samples were matched by hand, which proved to be very tedious and open to error (Davis et al. 2011:3). The introduction of the database marked a major improvement in data sharing among agencies. Various databases have been developed such as, AFIS (Automated Fingerprint Identification System), CODIS (Combined DNA Index System) and NamUs (National Missing and Unidentified Persons System) (Brady, King and Maguire 2017; Davis et al. 2011:3; Pettem 2013). The FBI is responsible for the ViCAP (Violent Criminal Apprehension Program) database that helps facilitate communication and coordination between agencies to support apprehension of violent and serial offenders (Davis et al 2011; Keppel 1992:22). The availability of these databases marks a major shift in departmental response to falling clearance rates, as it increases coordination and sharing of information.

Not only do investigators need to know *where* to look for resources, but also *how* to use them (Keppel 1992:16). It is imperative that investigators receive training on *how* to access these resources for them to be beneficial. However, for these resources to be *effective* they also need to be reliable (Keppel 1992:16). It is essential that case records contain as much information about as many aspects of the crime as possible. Thus, it is crucial that departments mandate information sharing and report statistics to the proper authority (Keppel 1992). "Research shows that if a suspect isn't in custody within 24

hours and if the murder is not solved within 48 hours, the chances of it ever being solved fall markedly" (Alexander and Wellford 2017:542; Keppel 1992:18;). Thus, Keppel (1992:17) suggests that the timely processing of information and evidence is vital and to be effective, "fast processing of information and evidence is important and requires coordination and cooperation between agencies" (Keppel 1992:15). This shows that ideally, a useful database should contain reliable, effective information; be readily available to law enforcement and is therefore crucial to contemporary cold case investigations.

Improvements in training for investigators are also recognized as imperative to combat falling clearance rates. Recognition of the need for specialized training in criminal investigations goes back to 1980's (Fisher, Svensen and Wendel 1980; Geberth 1986; Keppel 1992:12). Departments often struggle with funding for training and may fall short in their ability to properly train investigators. Being able to understand *how* and *where* to find information is important and to understand the basics of a specific database or other resource when these become available. For example, specialized training is required to learn how to access the NamUs public database or conduct searches with specific case characteristics (Salazar 2018:7). In general, investigators are given "very little information…relating to the actual steps, beyond original crime scene investigation, that detectives should follow" (Fisher et al. 1980; Geberth 1986; Keppel 1992:12). Keppel (1992) suggests falling clearance rates are directly related to lack of funding as well as undertrained personnel and overworked personnel. Research suggests that training for investigators can have a positive impact on cold case clearance rates.

Keppel (1992) further suggests that intervals of distance are also an important characteristic in clearance rates. The site of a crime is often separated by distance when an offender consciously separates the components of a crime and purposely attempts to stall the investigation (e.g., a body dumped far from the scene of crime). The offender seeks to hinder "an investigation by causing problems in communication and cooperation among police agencies because the locations of all sites are not within the authority of one police agency" (Hanfland, Keppel and Weis 1997:92). For instance, an offender may contact the victim in one area, kill them in another, and dispose of the body in yet another area(s) (Hanfland et al. 1997). Technology serves to close the distance between these sites and allow for the sharing of information among several agencies/areas. Inter-departmental information sharing "enables detectives from different agencies to be aware" of the crime and possibly link "murder committed by the same offender" (Keppel 1992:20). Advancements in the storing and sharing of critical information, i.e., through databases, were introduced for this purpose and will be discussed in more detail in the following paragraphs.

Cooperation between agencies even within the same jurisdiction is imperative. Specifically, the police and the prosecution must work together to boost both the efficiency and effectiveness of cold case investigations (Davis et al. 2011). For example, in Denver, the prosecutor comes in at the beginning of any homicide investigation and can offer advice on what kind of evidence (e.g., physical, documentary, witness, expert) may be most compelling at trial (Davis et al. 2011:v-xii). The particular investigator can then focus on building a case that, based on the evidence, will result in conviction. Cooperation among agencies could also boost case clearance across the nation.

However, a study conducted in the 1970's (Greenwood et al. 1977) and another in 2011 (Davis et al. 2011), both show that a dedicated system to monitor investigations is relatively non-existent. Davis et al. (2011: xiv) also found that investigators are more oriented toward clearing cases rather than winning conviction in court and there is little emphasis toward conviction as a goal. These findings illustrate the difficulty in combating falling clearance rates through inter-agency cooperation alone.

Cold case units or squads have been around since the 1980's, they have changed over time (Davis et al. 2011). The cold case unit comes in a variety of forms and has proven to be a popular way to address declining clearance rates across the nation and my research shows that the use of a cold case unit is an appropriate response. The 1980's showed a rapid growth in the development of Cold Case Units (Davis et al. 2011:4) but by 2011, only about 7% of agencies had such units (Davis et al. 2011:43). Similar to the use of various databases, successful case clearance has broadened the idea of a using this specialized unit to other crimes, such as sex assault and property crime (Hough et al. 2019). It is most common to wait until new information or new funding is available to re-open and examine evidence (Davis et al. 2011:4). The increase in cold case squads was in response to the increasing number of cold cases, overwhelmed detectives, and newly available means to tackle them (Hough et al. 2019; Davis et al. 2011:4). The assumption here appears to be that specialization in unresolved cases by some detectives would lead to better outcomes, i.e., more cold cases would be resolved.

While a "consensus on how a cold case unit should be implemented" does not exist there are several types of strategies and organizing principles that a department can use (Allsop 2018; Davis et al. 2011:4; Turner and Kosa 2003). There are cold case

units, squads, forensic services, homicide teams, etc. Davis et al. (2011) lay out three types of cold case investigations. First, the detective picks up the case because of the victim's family, a media inquiry or during a protocol review of cases where a systematic and periodic review of cases is implemented as standard procedure. This type of unit organization is the least common, mostly costly and yields the lowest success rate (Davis et al. 2011: xii). Secondly, there is a submission or re-submission of DNA which is more common when federal funds are available (Davis et al. 2011: xii). Submitting DNA is relatively inexpensive but yields a success rate fewer than fifty percent. And third is a case is opened because a suspect confesses as part of plea deal or because an eyewitness wants to trade information for leniency. This alternative is less expensive and often results in higher clearance (Davis et al. 2011: xii). Depending on the type of information and funding available, a cold case unit chooses to re-open cases based on the solvability potential for that case.

In Colorado, for example, the CBI has (1) a Cold Case Task Force (CCTF), (2) a Cold Case Review Team (CCRT) and (3) a Cold Case Homicide Team (CBI 2021). Each unit has a specific goal and contributes to falling cold case clearance rates. The following looks at each of these specialized units in more detail.

The Colorado Legislature passed a bill that would create a Cold Case Task Force (CCTF) associated with the CBI. Beginning in 2001, the CCTF was created as an entity that "provides public awareness, victim support, investigative best practices, and case review with the goal of creating forward momentum to solve cold cases and bring justice for victims and their loved ones" (CBI 2021). The CCTF meets four times a year and is "made up of 16-members… including but not limited to, district attorneys, victims' advocacy organization representatives, a sheriff, chief of police and a forensic

pathologist" (Salazar 2018:3). Kathy Stasak began as the chair of the task force meetings and suggested it is critical to choose the right people and get leadership involved, both prosecution and lab personnel (Regensburger 2014). It is mandated that law enforcement and family members are represented and became the driving force of greater understanding for everyone involved in or affected by an unresolved homicide. The family saw that law enforcement really did care about their case and was the "catalyst that caused agencies to realize the importance of investigating cold cases (Regensburger 2014). The CCTF continues to be successful in their goal to create a more positive relationship between law enforcement and family members.

The Cold Case Review Team (CCRT) began in 2009. CBI (2021) was looking for a way "to provide additional tools to investigating agencies which provides guidance but allowed the heart of the investigation to remain with the local agency". The CCRT is a 35-member team "comprised of professional investigative, analytical, and forensic experts from across the state" (CBI 2021). The key to a successful outcome is to have skilled professionals on the team. They serve as a "different set of eyes" and can give a new perspective to cold case investigations (Regensburger 2014; Salazar 2018:5). A law enforcement agency can request assistance through a lengthy application process that helps select cases that have the best chance for resolution. The solvability of a case can be determined by the factors of that specific case, including the quality and preservation of evidence, quality of witness interviews, quality of crime scene investigation, evidence collection and available means of analysis (Keppel 1992:11). The CCRT meets quarterly and reviews one or two cases per meeting (CBI 2021). The objective of the CCRT is to make suggestions for additional steps that could generate new leads or shore up loose ends (CBI 2021; Regensburger 2014).

CBI (2021) also has a Cold Case Homicide Team that consists of one employee within CBI to create a state-wide database of all homicide in the state since 1970 (Salazar 2018:5). At the beginning, the goal was to create a complete inventory of all homicide in spreadsheet form. The CBI Cold Case Database is now a fully searchable website (CBI 2021; Regensburger 2014) and has dual purposes. First, it is a record of all unresolved homicides and secondly, it is a tool to assist in connecting multiple investigations (CBI 2021; Salazar 2018:5). The website contains information from Colorado homicides since 1970 that have been open for three years or more, including "long-time missing person cases and unidentified remains" (Regensburger 2014). That database became the original source of the data for this study.

3.b. Technological Advancements: DNA and Databases

Advancements in technology have been helpful to investigators in their response to declining clearance rates. Homicide investigators are increasingly focused on technology, especially DNA analysis, when it comes to cold case homicide investigations (Brady et al. 2017:178). However, other technological tools are also used today, such as forensic evidence, ballistics imaging, etc. (Brady et al. 2017; Davis et al. 2011:3). The following discusses these advancements in more detail.

DNA analysis was introduced in the 1980's; at about same time as clearance rates began to decline (Davis et al. 2011:3). Early use of DNA was strictly confined to exonerate a suspect or to strengthen a case against that individual but could not be used to search a database of samples. With the introduction of databases, DNA was used to identify suspects when there were none detected in the initial investigation (Davis et al. 2011:3). There is a growing nexus between homicide investigations and technology, but "limited information exists on [the] use of technology in homicide

investigations" (Brady et al. 2017:517). Brady et al (2017:519) further state that a "support network [is] crucial to ensure databases are fed sufficient inputs and outputs (hits) are quickly produced and disseminated to investigators". It was previously suggested that training for how to utilize the new technology is essential for investigators but, as seen above, continues to be very limited.

In response to increased caseloads, the Federal government developed a system of national, state and local DNA databases in the 1980's (Davis et al. 2011:4). As a result of efforts to quickly disseminate information across departments, today these systems have been consolidated into one large database called CODIS (Combined DNA Index System) that includes all local, state, and national data. Davis et al. (2011:4) explain that the CODIS database consists of a "convicted-offender index" that includes DNA profiles of individuals convicted of certain crimes as well as a "forensic index" with DNA profiles of evidence collected from a crime scene. To locate a match, a sample is submitted into CODIS and the software searches across all fifty states, different indexes, and tiers to locate a match or hit. CODIS includes information about offenders from all fifty states from the beginning, but only those convicted of murder and sex offenses (Davis et al. 2011:4). Today it incorporates offenders from 46 states who were convicted of any violent offense. Other states have expanded this tool to include not only violent offenders, but convicted burglars, felons and even drug offenders. As time goes on, CODIS "includes an expanding population of criminals from whom DNA samples are taken" (Davis et al. 2011:4). The creation of the DNA database and its expansion has been monumental in combating falling cold case clearance rates.

Databases of DNA evidence are particularly helpful in solving serial crimes (Davis et al. 2011:4). A central DNA database enables departments to search crimes by

the same offender across jurisdictions and borders (Keppel 1992:20). DNA profiles can be linked through CODIS, such as was seen in the case of The Green River Killer (Davis et al. 2011:4). These databases have been useful in making the clearance rate better than it would have been without them. Investigators have used the same idea to solve other types of crime, such as arson and other property offenses. It is suggested that criminals will avoid committing a crime if they know DNA testing is required.

New technology can also be seen in databases holding information about various aspects of a particular crime and the investigation that followed. For example, physical evidence comparative databases (PECDs) store specific case information about paint, shoe prints, tire tracks, etc. (Davis et al. 2011). Another resource available to investigators is IBIS (Integrated Ballistics Information System), the ballistics imaging database, that can compare whether a bullet came from a specific gun and if that gun has been used in previous crimes (Davis et al. 2011). In these various databases, investigators can compare one source to others and if the database finds a matched sample, it automatically produces what is called a "hit" (Davis et al. 2011:3) and alerts detectives working on the case. These *hits* create new case information that can be used to clear the case and impact overall clearance rates.

Other technological advances that aid in case clearance include the following: blood splatter analysis, voice stress analysis in interviews, cell phone tower and location data, social networking sites, automated license plate readers, use of mass and social media to apprehend a suspect, use of Cold Case Units etc. (Brady et al. 2017:517-18; Davis et al. 2011:4-5). Brady et al. (2017:518) note that many advancements are mostly related to "information-based technology". These technological advances have been

significant in helping solve some cases by providing additional tools for detectives. Nevertheless, as noted earlier, the resolved homicide rate continues to fall.

In sum, the last four decades have brought about immense changes in terms of how departments respond to increasing caseloads and decreasing clearance rates. Advances in agency cooperation, databases and DNA technology have been helpful to addressing falling clearance rates. While these advancements have led to some improvements; unfortunately, the rate of unsolved cases continues to swell.

4. Conclusion

In sum, this literature review has discussed research related to cold cases. The first section presented a review of the history of unresolved homicide along with identifying the mounting issue of falling clearance rates for homicide across the nation. The introduction to this rising issue provides definitions and offers several explanations for this marked decline in rates, including urbanization, changes in the nature of homicide, mistrust of police, and lack of funding. By focusing on *why* the rate change phenomenon is happening, we can learn and develop tools to manage the situation.

Section two of this chapter focused on the factors associated with case clearance. By systematically screening cases for investigative potential, investigators look at the solvability potential for each specific case. Prior research has found several factors that are associated with case clearance. For example, we can look at the solvability potential of case-specific factors, such as victim demographics or the weapon that may have been used. Investigative factors, such as how many detectives are on the case, funding, resources available, etc, are useful when considering investigative potential. Thus, a review of the research shows a mix of case/demographic factors along with agency/investigative factors influence clearance success in a given case.

The third section details police departmental responses to declining homicide clearance rates. Technology has been essential in improving agency cooperation, including mutual sharing effective and reliable information. Various databases containing vital case information are now available to investigators, such as AFIS (fingerprint database), CODIS (DNA database), PECD's (physical evidence database), NamUS (National Missing and Unidentified Persons System) and IBIS (ballistics information database). Advancements in DNA analysis have led to the clearance of some cold cases. Training is another important addition when it comes to incorporating newly developed technology and thereby changing clearance rates. Another innovation has been the development of specialized cold case units. Improvements in agency cooperation, technology, databases, advanced training, and the growth of cold case units have all been developed over the past few decades to combat falling clearance rates.

In conclusion, the previous review of the literature and research related to cold case homicides considers the changing dynamics of American society and its relationship to falling clearance rates. The literature shows that by focusing on certain factors associated with clearance, we may be able to impact and improve the overall rate of cold case clearance. Agency cooperation, advances in technology and the use of specialized units are all current responses of law enforcement. However, despite all these advances, overall clearance rates for homicide have continued to fall.

CHAPTER 2. DATA AND METHODS

With the number of cases rising and clearance rates falling, it's imperative to find ways to manage the growing cold case log and to identify what characteristics are important in solving homicides that had previously been unsolved. The data for this research comes from information about *solved* homicide cold cases in Colorado between 1970 and 2017 and includes thirty-two variables for 111 cases. The aim was to evaluate relationships across previously unsolved homicide cases in Colorado that had been subsequently resolved. This will enable me to investigate patterned outcomes moving from cause of death towards cold case homicide resolution. Because I knew that these homicides had been resolved at some point in time, I sought to discover what independent variables could be identified as relevant when analyzed by cause of death.

For this study, we will define the term, "cold case" as any homicide open for more than 3 years, as used by the Colorado Bureau of Investigation (CBI 2021), the organization that provided the dataset for this study. Data were also collected from various additional sources including law enforcement personnel, law enforcement websites and online newspaper articles. Once data collection was completed, a two-step analysis was performed. Qualitative analysis of the data generated typologies or categories that defined the parameters of each independent variable. These broad types were then coded mathematically for quantitative analysis. This section considers discusses where the data came from, the methods used and the data collection process, as well as subsequent analysis procedures.

The source of data for this research is the CBI's Cold Case Database (CBI 2021). As previously mentioned in the literature review, the CBI's Cold Case Database

is a record that contains "unresolved homicide cases, long-term missing person cases and unidentified remains in [Colorado] where 3 years have passed since the crime occurred dating back to 1970" (CBI 2021). It is updated yearly, and most cases contain general demographic information about the victim, a photograph of the victim and, in some cases, information about the case itself (CBI 2021). It also contains solved cold case homicides in Colorado from 1970 to 2017. The database is accessible to the public and can be reviewed by law enforcement, the public, and family members alike. Accessibility and the reliability of information made this a satisfactory source to work with for research purposes.

Early in my research, it became clear that I would not be able to access all of the solved cold case records in CBI's Cold Case database as I had planned. In 2016, I searched for "solved" cases in CBI's Cold Case Database and came up with a list of about 25 cases, but there were cases I *knew* were missing from the record. In 2017, I met with CBI's data specialist, Audrey Simkins and her assistant, Jamie, who oversee the database. In the meeting I explained my research and the issue I was having in finding a *complete* list of solved cold cases to use as the original source of data for my research. She explained that some solved cases are inaccessible to the public as the case may be *exceptionally cleared*. They thus could be pursued in the future, such as if a victim decides to cooperate when previously uncooperative or a suspect is extradited when previously denied because they committed a crime in another jurisdiction (FBI 2010). She agreed to provide me with a list of all *solved* cold cases to use in my research and over the next three years we exchanged several emails. I received most of the solved cases on the list in early 2018 and by September 2019, I had received the

last ten cases in the dataset. Armed with a complete dataset of victim names, I moved further into gathering other needed data.

With the foundation of a dataset in-hand, the laborious process of collecting other data began. Due to privacy concerns, CBI had to redact certain information from the logs and in the end, I was mainly given the victim's name and, in some cases, limited information about the case such as a date when or the place where the crime/death occurred, the suspects involved, etc. I began further data collection in 2016 as soon as I had a partial list of victims' names to work with and completed the process in in 2020 after receiving the complete list in September 2019. Collecting the additional data was an arduous process that required searching a variety of secondary sources/types of information.

The other data I collected were obtained from several secondary sources and were mostly qualitative in nature. I began with an internet-search of law enforcement agency websites and looked for cold case sections within each department that might provide additional case information. Sometimes I contacted the public information officer or cold case detective via email or telephone, although I did not encounter a lot of cooperation using this route. I had better luck with the contacts I met when attending periodic Cold Case Task Force meetings. For example, I contacted a Boulder police detective, a Colorado Springs detective, and a Denver Victims Assistance Program Coordinator for information about cases in their department. It was helpful to have contacts in areas with many unsolved cold cases, such as Colorado Springs and Denver. If these sources did not turn up information for all of the variables being collected, I turned to Google to do a search. I conducted a search for the victim's name(s), the date(s), location(s) or any other information that I already had about the

case. Often the Google-search led me to newspaper articles, mainly the Denver Post, Denver Westword or other small-town newspapers associated with the area(s) the crime may have occurred in. For example, the Boulder Daily Camera (Daily Camera), Colorado Springs Gazette (The Gazette), Fort Collins Coloradoan (Coloradoan), Greeley Tribune (Greeley Tribune), Pueblo Chieftain (The Pueblo Chieftan) etc were very helpful. In some cases, I struggled to find *any* information and utilized a database from the Families of Homicide Victims and Missing Persons (FOHVAMP). This mainly gave me the date of birth for the victim which sometimes helped to locate additional information elsewhere. I also utilized the Parents of Missing Children's (POMC) website and searched obituary sites and Facebook pages dedicated to the memory of the victim. In general, most of the data used in this study comes from secondary news sources covering the case from when the crime occurred to when the suspect(s) were convicted and sentenced. In sum, the additional data I utilized was collected mainly via the internet, but email and telephone were also used as methods of data collection. Once data collection was complete, I began working on analysis of the dataset.

To evaluate relationships across previously unresolved homicide cases in Colorado, two analytic steps were utilized. First, as noted above, data were collected on 111 cases over a period of four years from a variety of sources. Once the data were collected, details were entered into Microsoft Excel as rich data including characteristics specific to each case. Next a qualitative analysis of the data generated typologies or categories that defined the parameters of each variable. The broad types of variables are (1) information about causes of death, (2) information about victims, (3) information about suspects, and (4) information about the investigation and evidence.

More specifically, the following variables were used for data collection. (1) Information about cause of death included the variables: cause of death, place of death and incident date. (2) Information about the victims included the variables: age at incident, date of birth, gender, race, height, weight, if a co-victim was involved and if the victim had children. (3) Information about the suspect was considered with the following variables: suspect's name, age at time of incident, age at conviction, gender, race, relationship to victim, the crime suspect is charged with, sentence, and if more than one suspect was involved with the case. (4) Variables related to information about the investigation and evidence included the following: who reported the incident, initial reason for incident report, date the victim's remains were found, who found remains, the crucial break in the case, possible motive suspected, if witnesses came forward, if DNA or fingerprints were used in case resolution, whether the death was gang-related, whether a cold case unit was involved, and if a weapon was used. In all thirty-two variables were constructed and each was then coded for quantitative analysis. Appendix A displays a complete list of variables and their coding scheme.

Exploratory correlative tests were implemented to investigate patterned outcomes moving from cause of death towards cold case homicide resolution. Because I knew the homicide had been resolved at some past point in time, I sought to discover what variables were correlated with each type of cause of death. Of the thirty-two independent variables, ten displayed noteworthy correlations across the five causes of death. These findings are presented in the next chapter.

The original dataset contained one-hundred and eleven (111) unique cases. Data were excluded based on documented cause of death as follows. There were thirty-seven (37) firearm deaths, nineteen (19) stabbing or knife deaths, fourteen (14) deaths

by asphyxiation, nine (9) bludgeoning deaths, three (3) deaths related to burning or immolation, six (6) undetermined causes of death, two (2) instances where no body was recovered, and twenty-one (21) cases where no cause of death was documented. The twenty-one cases where no cause of death was documented were dropped from the actual analysis. The six undetermined cause of death and two instances where no body was recovered were not included in the visual of the analysis because they failed to yield any correlative results. After the exclusion process the dataset yielded a total of ninety (90) valid cases that were used for further analysis. Details about how the variables were coded and related information are provided in Appendix A below.

Limitations of this study include certain characteristics of design or methodology that influenced the interpretation of the findings from this research study and thus these findings need to be interpreted carefully. The limitations discussed here include a lack of previous studies, choice of analytical technique, data collection, sample size and scope of discussion. The literature on this topic is developing as we speak and thus, in the literature review there was a lack of previous research studies on the topic of *SOLVED* cold case homicides in particular. When formulating an analytical technique for this study, it can be said that the analytical tool used here is too broad in scope. Although there are some more focused testable hypothesis in the literature review, exploratory correlative tests were implemented here to investigate patterned outcomes moving from cause of death towards cold case homicide resolution. While there are some focused findings are presented in the literature review that could be used as testable hypothesis, I decided to go with an exploratory analysis that looks at all variables because as far as *solved* cold case homicides go, given t hat this study marks the beginning of research for the topic of *previously unresolved but now solved* cold

case homicides. Furthermore, while I did not necessarily answer all of the questions that I started with, this study adds to the literature and provides direction for the future nonetheless.

Limitations also exist when considering data collection methods. This study is not free of flaws in data collection and the length of time I spent collecting data can be seen as one of those flaws. Furthermore, I experienced limited access to data as the information was of a sensitive nature. Another point to make here is the questionable quality of secondary source information, especially considering that newspaper articles are subject to error.

Sample size as a whole isn't a problem here (N=111), but when we consider the exclusion process, statistical tests may not able to identify significant relationships in these analysis because of excluded cases. For the qualitative part of the analysis, a mark out coding process was implemented to eliminate any cases where information about victims, information about suspects, and information about the investigation and evidence are not linked with a cause of death. This resulted in small sample sizes for certain variables, namely the six cases of undetermined cause of death and two cases where no body was recovered. These were not included in the visual of the analysis because they failed to yield any correlative results. The scope of discussion could be also be expanded upon by focusing more on the use of the specialized units in cold case homicide case. This isis offered as a suggestion for further research.

In conclusion, the methodology for this research consisted of three parts. First a dataset was obtained from CBI's Cold Case database that was both complete and reliable source and formed the foundation for this project. Next, I began data collection on thirty-two variables that covered information about the cause of death, information

about the victims, information about the suspects and information about the

investigation and evidence. Finally, analysis was done in two parts and involved both

qualitative and quantitative data.

CHAPTER 3. ANALYSIS

The data were imported into Stata (Version 15) and coded by category and

variable. This resulted in seven (7) causes of death and thirty-two (32) unique

independent unresolved homicide variables. The analysis performed here uses the

seven causes of death as dependent variables that are then correlated with the 32

independent variables. The reason for this decision has to do with crime solvability

research which indicates that circumstances surrounding each type of cause of death

and its resolution are likely to be varied (Coupe, Ariel, & Mueller-Johnson 2019). Thus,

lumping in all causes of death and analyzing how the independent variables correlate

with them is likely to be less productive. Of the seven cause of death variables, five (5)

displayed unique correlations with fourteen (14) unresolved homicide variables. A mark-

out coding scheme was implemented in the Stata coding to remove any unresolved

homicide variables that were not represented by a cause of death variable. This mark-

out coding process eliminates any cases where information about victims, information

about suspects, and information about the investigation and evidence are not linked

with a cause of death.

Table 1: Number of Unique Observations by Category & Variable

Variable Type 1: Cause of Death (N=90)	Observations & Percentages	Variable Type 2: Victim Demographics	Observations & Percentages	Variable Type 3: Investigation Information	Observations & Percentages
(a) Firearms	37 of 90 or 41.11%	(1) Victim was Female	43 of 90 or 47.78%	(10) The Crime had Witnesses	50 of 74 or 67.50%
(b) Knives	19 of 90 or 21.11%	(2) Victim was White	31 of 51 or 60.78%	(11) DNA Used in Resolution	35 of 62 or 56.45%
(c) Asphyxiation	14 of 90 or 15.56%	(3) Victim was Black	9 of 51 or 17.65%	(12) Fingerprints Used in Resolution	1 of 62 or 1.61%
(d) Bludgeoning	9 of 90 or 10.00%	(4) Victim was a Student	5 of 46 or 10.87%	(13) Crime was Gang Related	12 of 67 or 17.91%
(e) Burning	3 of 90 or 3.33%	(5) Victim was Unemployed	4 of 46 or 8.70%	(14) Cold Case Unit was Involved	37 of 64 or 57.81%
(f) Undetermined	6 of 90 or 6.67%	(6) Victim was Unmarried	24 of 51 or 47.06%		
(g) No Body Recovered	2 of 90 or 2.22%	(7) Victim Used Drugs	12 of 68 or 17.65%		
		(8) Victim Sold Drugs	4 of 68 or 5.88%		
		(9) Victim felt in Danger	10 of 45 or 22.22%		

Table 1 displays the number of unique observations by category and variable. This is presented in three columns following the categories of variables including (1) information about causes of death, (2) information about victims, and (3) information about the investigation and evidence that displayed correlative results. Each variable also shows the number of observations that were coded as an affirmative response and the percentage of that variables total the affirmation represents. For example, category Variable Type 2: Victim Demographics variable (1) shows that the Victim was Female in 46 of 90 cases or 47.78%.

The first column of Table 1 (that is labeled Variable Type 1) includes the frequency as well as the percentage of that variable total across seven Causes of Death, including: Firearm, Knives, Asphyxiation, Bludgeoning, Burning, Undetermined and No Body Recovered. Results for these Causes of Death are discussed in more detail here. Causes of death by Firearms shows 37 of 90 or 41.11% of the total are attributed to this variable type. The table shows that 19 of 90 or 21.11% of causes of

death are attributed to Knives. Asphyxiation makes up 14 of 90 or 15.56% of the total and bludgeoning, accounts for 9 of 90 or 10% of the total. Causes of death by Burning, displays 3 of 90 or 3.33% of the total of all seven causes of death shown in Variable Type 1. Undetermined cause of death makes up 6 of 90 or 6.67%. The final variable in category in the causes of death is No Body Recovered which accounts for 2.2% or 2 of the 90 total cases.

Variable Type 2: Victim Demographics shows observational frequency and percentages for nine specific variables regarding information about victims. These nine (9) variables are as follows: Victim was Female, Victim was White, Victim was Black, Victim was a Student, Victim was Unemployed, Victim was Unmarried, Victim used Drugs, Victim Sold Drugs, and Victim felt in danger. Considering the variable, Victim was Female, the data displays 43 of 90 or 47.78%. Victim Demographics variable, Victim was White shows 31 of 51 or 60.78%. Victim was Black displays 9 of 51 or 17.65% of the categorical total. Victim was a Student accounts for 5 of 46 or 10.87% of the total are attributed to this victim demographic variable. The table further shows that 4 of 46 or 8.7% of cases in this dataset are attributed to the variable, Victim was Unemployed. Victim was Unmarried, accounts for 4 of 46 or 8.7% of the total. Victim Used Drugs, displays 12 of 68 or 17.65%. Victim Sold Drugs makes up 4 of 68 or 5.88%. The final variable in Variable Type 2: Victim Demographics is Victim felt in Danger, which displays 10 of 45 or 22.22%.

The third column shown in Table 1 is Variable Type 3: Investigation information and shows information about the investigation and evidence. Variable Type 3: Investigation Information includes five (5) specific variables. The five variables include, The Crime had Witnesses, DNA Used in Resolution, Fingerprints used in Resolution,

Crime was Gang Related, and Cold Case Unit was Involved. Table 1 shows

observations and percentage for each of the five investigative variables and are

discussed here. Investigation Information variable The Crime had Witnesses shows 50

of 74 or 67.5%. DNA Used in Resolution accounts for 35 of 62 or 56.45%. Table 1

suggests that in 12 out of 57 or 17.91% of cases the Crime was Gang Related. A Cold

Case Unit was involved in solving the crime and accounts for 37 of 64 or 57.81% of that

variable's total.

Table 2: Cause of Death - Pairwise Correlation Matrix [Correlation Strength Indicator & Significance] **N=90**

	(a) Firearms	(b) Knives	(c) Asphyxiation	(d) Bludgeoning	(e) Burning
(1) Victim was Female (n=90)	-0.4827 ***	0.2683 *	0.2032	0.0519	-0.0537
(2) Victim was White (n=51)	-0.3779 **	0.1012	0.2037	0.2648	-0.0446
(3) Victim was Black (n=51)	0.2816 *	-0.1527	-0.0352	-0.1526	-0.0935
(4) Victim was a Student (n=46)	-0.1654	0.3926 **	-0.1479	-0.1220	-0.0521
(5) Victim was Unemployed (n=46)	-0.1150	-0.1416	-0.1307	0.3880 **	0.4830 ***
(6) Victim was Unmarried (n=51)	-0.1866	0.2849 *	0.1334	-0.0466	-0.1333
(7) Victim Used Drugs (n=68)	-0.0738	0.1637	0.0692	-0.1440	0.2639 *
(8) Victim Sold Drugs (n=68)	0.2988 *	-0.1215	-0.1215	-0.0778	-0.0305
(9) Victim felt in Danger (n=45)	0.4088 **	-0.1797	-0.2485	-0.1153	omitted
(10) The Crime had Witnesses (n=74)	0.2372 *	0.1237	-0.1651	-0.2172	0.0811
(11) DNA Used in Resolution (n=62)	-0.3335 **	0.1752	0.2926 *	-0.0426	omitted
(12) Fingerprints Used in Resolution (n=62)	-0.0851	-0.0787	-0.0659	0.3912 **	omitted
(13) Crime was Gang Related (n=67)	0.4892 ***	-0.2401	-0.2182	-0.1595	0.1468
(14) Cold Case Unit was Involved (n=64)	-0.3797 *	0.0992	0.2990 **	0.0359	omitted

Note: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

Exploratory correlational tests were then implemented to investigate patterned

outcomes moving from each cause of death in terms of its association with various

victim demographic and investigative information variables. Because I knew the

homicide had been resolved at some past point in time, I sought to discover what

potential similarities could be identified across the variable types. Table 2 provides a

complete list of the variables and their correlations with the dependent variable, the five

causes of death. Of the thirty-two variables, fourteen displayed noteworthy correlative

properties across the five causes of death. I will discuss them in detail below.

Following the methodological protocol, Table 2 displays a pairwise correlation matrix specific to causes of death listed as (a) Firearms, (b) Knives, (c) Asphyxiation, (d) Bludgeoning, and (e) Burning. Case variables are divided into three broad types. First are victim demographics: [(1) Victim was Female, (2) Victim was White, (3) Victim was Black, (4) Victim was a Student, (5) Victim was Unemployed, (6) Victim was Unmarried, (7) Victim Used Drugs, (8) Victim Sold Drugs, and (9) Victim felt in Danger]. Second are evidence phenomena: [(10) The Crime had a Witness, (11) DNA Used in Resolution, (12) Fingerprints Used in Resolution, & (13) Crime was Gang-Related]. Lastly, whether (14) a Cold Case unit was Involved in the Investigation is considered.

When focusing on the significant outcomes for unresolved deaths caused by Firearms we can see a strong, negative, significant correlation (-0.4827***) with being Female, i.e. cases involving females killed by firearms are less likely to be solved. Likewise, there was a moderate, positive, significant correlation (0.2816*) between victims identified as Black and Firearms death, while White victims displayed a moderate, negative, significant correlation (-0.3779*) outcome for previously unresolved, but now solved Firearms deaths. We can also see a moderate, positive, significant correlation (0.2988*) on whether the Victim Sold Drugs and a strong, positive, significant correlation (0.4088**) when there was evidence that the Victim felt in Danger prior to an unresolved Firearms death. Firearms deaths displayed a moderate, positive, significant correlation (0.2372*) for The Crime had a Witness and a moderate, negative, significant correlation (-0.3335**) for DNA Used in Resolution of the case. There is a strong, positive, significant correlation (0.4892***) of the Crime was Gang-Related with death by Firearms. Further, the moderate, negative, significant correlation (-0.3797**) for firearm deaths with whether a Cold Case Unit was Involved which suggests that

these units were not likely to be productive in a resolution. While there are many factors at play in this dataset, it shows the uniqueness of firearm deaths is that a lower likelihood of leaving behind DNA evidence that could be analyzed. The transference of evidence derived from Edmund Locard's famous exchange principle (which suggests that "Every contact leaves a trace") supports how the use of a firearm decreases the likelihood of offender to victim and offender to environment contact. Given the lack of contact, any investigation is left with the related victim variables, potential witnesses, and ballistics evidence. All of these present difficulties in building a homicide case towards arrest or conviction without the proverbial smoking gun.

When looking at the significant outcomes for unresolved death (later resolved) caused by knives we can see a moderate, positive, significant correlation (0.2683*) with being Female, meaning that such cases involving females are more likely to be solved. Death by Knives displayed a moderate, positive, significant correlation (0.3926**) with Victim being a Student. We can also see a moderate, positive, significant correlation (0.2849*) when the Victim was Unmarried and had a cause of death by knife, meaning that cases involving unmarried victims are more likely to be solved and can be related to the likelihood of transference of evidence as previously discussed. Using a knife as a means of homicide increases the likelihood of an offender leaving trace evidence on the victim and/or the surrounding area as compared to death by a firearm which suggests there is a lower chance of leaving trace evidence. The higher likelihood of leaving DNA or other trace evidence behind is important in an investigation as the presence of evidence is often what ultimately aids in a case making it all the way to a conviction. Victim being a Student or Victim being Unmarried can be related to the greater likelihood of younger age demographic that is involved in knife violence resulting in

homicide. All these factors suggest that when knives are used in a homicide, it increases the chances of leaving evidence that will build to a successful case resolution.

When focusing on the significant outcomes for unresolved death caused by asphyxiation, we see a moderate, positive, significant correlation (0.2926*) with DNA Used in Resolution. Again, this relates back to Locard's exchange principle which suggests there is a greater chance of leaving DNA and other types of evidence in homicides that involve physical contact between a victim and offender. Compared to that of a firearm homicide, it is evident that death by asphyxiation is distinctive from other types of death in that the act of asphyxiation itself necessitates close contact between a victim and offender. Similarly, we can see a moderate, positive, significant correlation (0.2990**) with Death by Asphyxiation and whether a Cold Case Unit was Involved. This suggests that a Cold Case Unit is likely to be involved productively in the resolution of previously unresolved homicide cases with death by asphyxiation. It can be suggested that the correlation between greater chances of having DNA evidence used in the resolution is directly related to the use of a cold case unit in previously unresolved but now solved cases of death by asphyxiation.

When evaluating Asphyxiation as the only other cause of death that displayed a correlation with the variable Cold Case Unit was involved we can identify a very different pattern of offender and victim co variations. The moderate, positive, significant correlation (0.2926*) of DNA Used in Resolution and moderate, positive, significant correlation (0.2990**) of Cold Case Unit was Involved. Asphyxiation displays how transferable offender identifier evidence is important even when other factors are missing. The ability to engage a cold case unit, across changes in availability and accuracy of DNA evidence with advancing technologies, is basically linked to the initial

transfer and collection of evidence. Again, fundamental principles of evidence exchange display importance differences in offender and victim contact as an asphyxiation homicide is occurring.

When looking at the significant outcomes for previously unresolved death caused by bludgeoning, the data show a moderate, positive, significant correlation (0.3880**) with the victim being unemployed. We can also see a moderate, positive, significant correlation (0.3912**) between death by bludgeoning and whether fingerprints were used in the resolution, meaning that cases where the cause of death is bludgeoning are more likely to be solved if fingerprint evidence is available. The dataset suggests that death by bludgeoning increases the chances of contact between offender and victim/offender and the environment. Thus, similar to death by asphyxiation cases we see that cases with bludgeoning as a cause of death are thus more likely to be solved as they offer means of resolution in the form of evidence, specifically fingerprint evidence.

When focusing on the significant outcomes for unresolved death caused by burning, we see that there are only two cases, and some correlation values are omitted for this reason. For what it is worth, there is a strong, positive, significant correlation (0.4830***) with victim being unemployed. This means that unresolved cases involving death by burning, are strongly more likely to be solved if related to victims who are unemployed at the time of their death. Furthermore, the dataset suggests that there is a moderate, positive, significant correlation (0.2639*) between cause of death by burning and whether the victim was identified as using drugs. This implies that when there is a death by burning, the victim demographic of drug use plays a large part in whether a

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case will be cleared. Again, given the very small number of cases of death by burning in this dataset, this finding ought to be taken with caution.

A point about the use of cold case units needs to be made in resolving homicides, given continuing support for their use (Turner and Kosa 2003; Allsop 2018). Cold case units emerged as significant here for two causes of death: it was less significant for and negatively correlated with solving firearm deaths while more significant for and positively correlated with solving asphyxiation deaths. From the above analysis related to the use of cold case units in resolving homicides, it emerges that they have some utility mostly in asphyxiation deaths.

CHAPTER 4. DISCUSSION

This chapter is devoted to providing a critical discussion of the findings and the initial analysis, when set against the existing literature as discussed in Chapter one. The overall aim of this study was to consider whether specific characteristics of a homicide impact its solvability. As seen in the literature review in Chapter one, there is a wide body of past literature that demonstrates the worrying issue of falling cold case clearance rates. Scholars such as Davis et al (2011) and Wellford and Cronin (1999) provide certain case factors that influence cold case clearance success and suggest urbanization has led to various changes that affect solvability. Previous literature by Keppel (1992:13) and Salazar (2018:5) state that agency funding is crucial and the level of funding often determines the resources available to cold case investigators. This is supported by Davis et al (2011) who shares this view.

Further analysis of the data reveals key findings that either contradict or support the previous literature discussed in Chapter one. These findings suggest that 1) case information, 2) agency specific factors and 3) victim demographics affect homicide clearance rates and do so by cause of death. **Case information** includes death by firearm as most common cause of death and least likelihood of being solved, and the availability of witnesses. **Agency-specific factors** include access to resources and data sharing abilities. **Victim demographics** show us how certain characteristics affect the solvability of a case, including: victim identifies as a drug user, if the victim is male, if the victim is unemployed, and if the is body recovered. The following discusses these in more detail.

Research literature shows that a main reason for declining cold case clearance rates is the rapid growth of urbanization. Davis et al (2011:2) and Wellford and Cronin (1999) suggest that with urbanization came a change in the type and nature of homicide. This includes increases in stranger-on-stranger homicide as well as increases in gun and gang-related violence (Davis et al 2011:2; Wellford and Cronin 1999). Data from Table1 in this study supports this argument, in that death by firearm is the most common cause of death (41.1%) compared to knives (21.11%), asphyxiation (15.56%), bludgeoning (10%), burning (3.33%), undetermined (6.67%) and no body recovered (2.22%) (Table1). This is further supported by research from Alexander and Wellford (2017:544), Davis et al. (2011:2) and IACP (1995) which suggests that certain factors are associated with urban homicide, such as the likelihood of the cause of death being by firearm.

As noted above, publications by Davis et al (2011:2) and Wellford and Cronin (1999) suggest that gang violence contributes to falling cold case clearance. The data in Table1 supports this argument, as "crime was gang related" in 12 of 67 or 19.1% of cases. Thus, gang-related violence contributes nearly 20% of all cold cases in my dataset. This further demonstrates factors associated with unresolved homicides include gun and gang-related violence.

Studies show that cases involving firearms are less likely to be solved than cases where other weapons are used (Addington 2006:12). Table 1 in this study shows less agreement with the literature, as "cause of death by firearm" accounts for 37 of 90 or 41.11% of *solved* but previously unresolved cold cases. The data show that cases involving firearm are more likely to be solved than cause of death by other weapons whereas the literature claims the opposite. When we consider that the literature

suggests 1) gun violence is increasing and 2) cases involving firearms are less likely to be solved than where the cause of death is a different method, this factor is contributing to the plummeting clearance rates. However, the data suggests that 1) homicidal gun violence is increasing *but* 2) that case clearance may also be greater for cause of death by firearm. This might suggest the tide is changing for this phenomenon of rising cold case clearance rates.

Previous literature has discussed the availability of witnesses and the impact of this factor when considering solvability of a cold case. Davis et al (2011:43) suggest that factors including, availability of witnesses [are] related to case clearance. Furthermore, the literature states that "80% of all homicides are solved by… information provided by the victim and/or witnesses" (Davis et al 2011: xiv). The data from Table 1 shows that the factor of, "crime had witnesses", accounts for 50 of 74 or 67.5% of previously unresolved cold cases in this study. The data do indicate that having witnesses helps unresolved cases become solved and thus agrees with the literature that the availability of witnesses is directly related to cold case clearance success.

Agency factors that affect solvability include issues such as access to investigative resources. Previous research by Keppel (1992:13) and Salazar (2018:5) state that funding is crucial, and the level of funding often determines the resources available to cold case investigators. Carter (2013) offers a list of best practice support functions, which include "use of specialized units" and that specialized units all require funding at hand for the resource to be available. CBI uses funding for training to increase cold case clearance including, "cold case squads" (Salazar 2018:6) specifically utilizing the Cold Case Review Team. According to Keppel (1992:21), research suggests that cold case units "can have a positive impact on cold case clearance rates"

and that falling clearance rates are directly related to lack of funding as well as undertrained and overworked personnel, but can be combated with use of a cold case unit. Thus, the literature suggests (Allsop 2018) that access to a cold case unit leads to greater clearance rates. The data in this study shows that 57.81% or 37 out of 64 previously unresolved cases were solved when a cold case unit was involved. This data supports the literature as both find that funding is related to accessibility of investigative resources such as cold case units. Access to such resources' leads should lead to better clearance. In the future, we may see increased utilization of cold case units for clearing cold case homicide loads. More recent work by Allsop (2018) and Hough et al (2019) suggest that more departments are following the trend as there has been an increase in cold case squads in recent years.

Publications by the Bureau of Justice Assistance and Carter (2013) suggest agency best practices, including "a system for standardized and structured management of investigations" (Alexander and Wellford 2017:542). These best practices show that the sharing of information is vitally important to cold case clearance success (Alexander and Wellford 2017:542). Various databases were discussed in the literature seen in chapter one, such as CODIS (the DNA database), AFIS (fingerprint database), IBIS (ballistics imaging), PECD's (physical evidence comparative database), etc. Previous literature shows that there have been major improvements in data sharing and that the creation of the "DNA database has been monumental in combating falling cold case clearance rates" (Brady et al 2017; Davis et al 2011:4). The data from Table1 of this study reveals that DNA analysis was used in resolution 35 of 62 or 56.45%. This data support the previous literature as it shows DNA was used to resolve 56% of the previously unresolved cold case homicides in the dataset. However, Table 1 also shows

that fingerprints were used in resolving just 1 of 62 or in 1.61% of cases and thus, the data contradicts the literature when looking just at fingerprint data. While "using DNA/fingerprints in resolution" is not the same as "using CODIS/AFIS to solve previously unresolved crimes", it does show the increased commonality of using available (here DNA and fingerprints) databases in case resolution. Informational databases may be instrumental in attempts to improve the homicide cold case clearance rate and may continue to do so in the future.

There are four victim demographic factors that will be discussed in terms of past literature and in connection with the results of this study. Davis et al (2011:44) suggest that "demographic factors are important, as cases involving victims that are… male often result in higher" clearance rates. Table 1 shows that in 52.2% of cases, the victim is male. The data suggests that more than half of victims in this dataset of previously unresolved cold cases were male (52.2%). The literature and current data both suggest that cases involving male victims result in higher clearance rates. Thus the data supports the literature's claim that male victims result in higher clearance rates.

Next, we consider another victim demographics factor: involving a victim who is identified as a "drug user". Research by Davis et al (2011:44) found several demographic factors associated with higher case clearance. For instance, it is more likely to be solved if it "doesn't involve a drug user (Davis et al 2011:44)". The data from this study slightly contradict Davis et al, as 12 of 68 or 17.65% of previously unresolved cold cases that were solved involved a victim who classified as a drug user. Though not conclusive, this study shows cases are still likely solved even if it includes a drug user, whereas literature suggests a case has a higher chance of being solved if it *does not* involve a drug user and thus the sources are contradictory.

Another important victim demographic to consider when looking at cold case clearance rates is whether a body was recovered. Davis et al (2011:44) found several case and demographic factors associated with higher case clearance. For example, a case is more likely to be solved if the body was found in a private residence (Davis et al 2011:44). The data from Table1 of this study show that no body was recovered in 2 out of 90 or 2.22% of cases; therefore, meaning that a body was recovered in the other 88. While this is not the same as the body being found in a private residence, the current data supports that finding, as recovering the body is important in a cold case. Doing so could result in finding more evidence and lead to higher case clearance.

The fourth victim demographic discussed here is when a victim is classified as having lower social status. The literature is clear that "social status is another important demographic factor to consider, as cases involving victims from lower social status often experience less case clearance than victims with that of higher social class" (Keel et al 2009:53). While not an exact comparison to "lower social status", we can look at the "victim was unemployed" category in Table 1 as a factor of solvability. The dataset in Table 1 shows that only 8.7% of cases were solved if the victim was unemployed. Thus, the study suggests that victims who are of a lower social status (i.e., unemployed) are less likely to experience case clearance than victims of a higher social status (i.e., employed). Thus, the data support this claim, as only 8.7% of previously unresolved cases were solved if the victim was unemployed.

A discussion of the literature compared to the results of the analysis performed, found a total of ten results that either contradict or support the previous literature. Judging from the analysis, eight of ten results support the current literature. The factors of 'cause of death by firearm' and 'victim classified as a drug user' are the ones that

contradict the current literature. The results of this study agree with the research that suggests funding is directly related to cold case clearance. Broadly speaking, my research is in agreement with the previous literature that suggests the importance of having a cold case unit to combat falling cold case clearance rates. While it doesn't directly contribute a large impact to unresolved homicide research, it does acknowledge the limitations and offers suggestions for solvability.

This study moves the existing literature forward by considering which of the independent variables help the police propel cold case homicides divided by cause of death from unresolved to resolved status. Looking at the performance of all the independent variables across all five causes of death (Table 2), four independent variables are associated with resolving previously unresolved cases across *two* causes of death. These are gender (for male firearm deaths and female knifing deaths); unemployment status (for bludgeoning and burning homicides; although the latter is based on only two cases); the use of DNA analysis (negatively for gun deaths and positively for asphyxiation) and the availability of a cold case unit (negatively for gun deaths and positively for asphyxiation}. In terms of investigative matters within the control of police departments and resources available in terms of DNA analysis and cold case units, their best use appears to be to help in deaths by asphyxiation. Death by asphyxiation is related to greater possibilities for leaving behind evidence and thus the cold case unit becomes relevant under these circumstances. Cold case units can help by knowing the techniques needed to best utilize preserved evidence from older, unresolved asphyxiation deaths.

Finally, if we take the most common (top two) causes of death, i.e., firearms and knifing, gender is the only independent variable that is associated with movement

toward resolved status. Given male firearm deaths and female knifing deaths are more likely to be moved from unresolved to resolved status, perhaps it is these two types of incidents that investigators should give priority to when triaging which cold cases deserve more attention first.

CHAPTER 5. CONCLUSION

The literature review reveals issues with falling cold-case clearance rates and departmental response to the factors affecting clearance. Urbanization, change in the nature of homicide, mistrust in police and lack of funding are the main factors affecting case clearance today in the United States. Law enforcement agencies are responding to declining cold case clearance rates in several ways. First and most important are improvements that increase agency cooperation across space and time. These include technological advances such as the introduction of databases and the use of DNA analysis. Agencies are also creating or expanding specialized cold case units to aid in increased clearance of a mounting cold case log.

This study researched the relationships across previously unresolved homicide cases that occurred between 1970 and 2017 and were later resolved. The origins of the foundational dataset are discussed in detail. A review of methods that were used in data collection is provided and draws from newspaper articles and professional contacts in law enforcement as main sources of information for this project. Analysis utilized qualitative and quantitative information in a two-step process. First, data was collected then qualitative analysis was used to generate typologies or categories that defined the parameters of each of the thirty-two variables collected. Second, the variables were constructed then coded for quantitative analysis. Correlative tests were implemented to investigate pattenened outcomes. Analysis suggests ten noteworthy correlative properties across the five causes of death. An analysis of cases related to the use of cold case units in resolving homicides emerged under two conditions, negatively for

firearms deaths and positively for asphixation deaths. These and other correlations are

discussed in detail. This study suggests that, among the most common causes of

homicide deaths (firearms and knives) investigating male firearm deaths and female

knifing deaths are more likely to be productive in moving from unresolved to resolved

status. There are, of course, limitations to the findings described and conclusions

drawn here as noted earlier. Nevertheless, this study's findings provide some directions

for future unresolved homicide research to pursue.

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APPENDIX A

Prior Unresolved Homicide Database Coding References

Original data was compiled from local law enforcement reports, Colorado Bureau of Investigation reports, and news media accounts of the victim, crime, suspect, and judicial outcomes. From a larger body of data, the following variables were re-coded for potential use in this thesis analysis. The coding script below describes how the data was managed in order to validate subsequent algorithmic methodologies. When information was unavailable or otherwise confounding it was coded out of sequence, marked as mathematical 99 or missing data.

Vic_Name – Victim Name.

Department – Colorado law enforcement agency overseeing the case.

Orig_Det – Name of the original detective of investigator of the homicide.

Case_Study- Qualitative information on why the case is considered resolved.

Vic_CoD – Victim cause of death [nominal]

1 = gunshot wound(s)

2 = knife or sharp object (stabbing & slashing)

3 = asphyxiation (manual strangulation)

4 = bludgeoning & blunt force trauma

5 = burns & smoke inhalation

6 = undetermined

7 = no body recovered

99 = missing data

Vic_Age – Age of the victim as the time of death or disappearance [interval/ratio in years]

0 = missing data (because 99 missing data code is a potential valid occurrence)

Sample ranges from 5y.o. to 94y.o.

Vic_Gender – Victim gender [dichotomous]

1 = Male

2 = Female

99 = missing data

Vic_Race – Victim race [nominal]

1 = Caucasian (White)

2 = Black (African American)

3 = Hispanic (Hispanic White & Hispanic Non-White)

4 = American Indian / Native American

99 = missing data

Vic_Occ – Victim occupation [nominal]

1 = Criminal History / Background (Drug Sales / Gang Activity / Prostitution / etc.)

2 = Service Industry (Non-business owner employee in non-professional positions)

3 = Professional Industry (Business owner or white-collar professional position)

4 = Professional Athlete

5 = Student (Primary, Secondary, Collegiate, or Graduate)

6 = Retired

7 = Disabled

8 = Unemployed

99 = missing data

Vic_Married – Marital Status [nominal]

1 = Unmarried

2 = Married

3 = Divorced

4 = Widowed

99 = missing data

Vic_Children – Victim was a parent [dichotomous]

1 = No

2 = Yes

99 = missing data

Vic_Risky – Victim displayed indicators of being at risk or engaged in risky behaviors [nominal]

1 = No

2 = Yes, drug use / alcohol use (excessive)

3 = Yes, drug sales / drug dealing

4 = Yes, high risk / frequency sexual activity or prostitution

5 = Yes, physical fighting / prior arrests for assault

6 = Yes, diminished capacity / mental disability / physical disability

7 = Yes, homeless

99 = missing data

Vic_Danger – Victim indicated that they believed they were in danger [dichotomous]

1 = No

2 = Yes

99 = missing data

Death_Loc – Location of victim death [nominal]

1 = Victim's home or on victim's residential property

2 = At the home of a family member or acquaintance of the victim

3 = Offender's home or on offender's residential property

4 = At a business location

5 = Public location in a city / town

6 = Rural or outdoor public location

7 = Kidnapped / relocated or moved / found in vehicle

8 = At hospital or during emergency medical services intervention

9 = Body not found

99 = missing data

Vic_Mis – Was the victim reported as missing to the police [dichotomous]

1 = No

2 = Yes

99 = missing data

CCU – A Cold Case Unit, special investigator, Colorado Bureau of Investigations or Federal Bureau of Investigations involved at some later date in the homicide investigation [dichotomous]

    1 = No

    2 = Yes

    99 = missing data

Closed – Conditions of the case being resolved or closed [nominal]

    1 = Suspect identified, but not arrested, charged, or convicted

    2 = Suspect identified, but deceased

    3 = Suspect arrested and or charged, but not convicted

    4 = Suspect convicted

    5 = DNA link to suspect, but no conviction resolution

    6 = DNA link to suspect led to conviction

    7 = Solved by exception

    8 = Suspect identified as Ted Bundy

    99 = missing data

Witness – Were there witnesses to the crime that were identified by the police [dichotomous]

    1 = No

    2 = Yes

    99 = missing data

Forensic – Notable forensic data used to solve the cold case [nominal]

    1 = No DNA evidence

    2 = DNA evidence

    3 = Fingerprints

4 = Odontology

5 = Advanced forensic technology, type not specified

99 = missing data

Gang – Gang related crime & victimization [nominal]

1 = No

2 = Yes

99 = missing data

Sus_Name – Primary Suspect Name (if available)

99 = missing data

Sus_Gender – Suspect gender [dichotomous]

1 = Male

2 = Female

99 = missing data

Sus_Race – Suspect race [nominal]

1 = Caucasian (White)

2 = Black (African American)

3 = Hispanic (Hispanic White & Hispanic Non-White)

4 = American Indian / Native American

99 = missing data

Sus_Occ – Suspect occupation [nominal]

      1 = Criminal History / Background (Drug Sales / Gang Activity / Prostitution / etc.)

      2 = Service Industry (Non-business owner employee in non-professional positions)

      3 = Professional Industry (Business owner or white-collar professional position)

      4 = Professional Athlete

      5 = Student (Primary, Secondary, Collegiate, or Graduate)

      6 = Retired

      7 = Disabled

      8 = Unemployed

      99 = missing data

Vic_Sus_Rel – Relationship between the victim and suspect [nominal]

      1 = Strangers

      2 = Criminal associates, nonviolent crime / drugs / vice / prostitution

      3 = Criminal associates, violent crime / gang

      4 = Customer / patron / business associate

      5 = Acquaintances / classmate

      6 = Neighbor / coworker

7 = Friends / roommate

8 = Family relative

9 = Significant other / intimate partner

10 = Former significant other / intimate partner

99= missing data

Sus_Known – Was the suspect known to the victim [dichotomous]

1 = No

2 = Yes

99 = missing data

Sus_Plea – Suspect's response to court charges [dichotomous]

1 = Not Guilty

2 = Guilty

99 = missing data

Sus_Deal – Suspect accepted a plea deal [dichotomous]

1 = No

2 = Yes

99 = missing data

Sus_Ided – The police or family / friends believe they knew who the suspect was throughout the investigation [dichotomous]

1 = No

2 = Yes

99 = missing data

Sus_Rec – Suspect has prior criminal record [dichotomous]

    1 = No

    2 = Yes

    99 = missing data

Sus_Risky – Suspect displayed indicators of being at risk or engaged in risky behaviors [nominal]

    1 = No

    2 = Yes, drug use / alcohol use (excessive)

    3 = Yes, drug sales / drug dealing

    4 = Yes, high risk / frequency sexual activity, prostitution, sexual assault

    5 = Yes, physical fighting / prior arrests for assault, physical violence

    6 = Yes, diminished capacity / mental disability / physical disability

    7 = Yes, homeless

    99 = missing data

Serial_Killer – Victim was murdered by a serial killer [dichotomous]

    1 = No

    2 = Patterned violence ahead of committing homicide

    3 = Suspected serial killer

    4 = Yes

    99 = missing data